Appendix I

Supplemental Correspondence and Technical Documents Related to Skate FMP Amendment 3

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Section

1. Document 1

Notification of skate overfishing, February 2007

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
One Blackburn Drive
Gloucester, MA 01930-2298

FEB 20 2007

RECEIVED
FEB 21 2007
NEW ENGLAND FISHERY
MANAGEMENT COUNCIL

Paul J. Howard, Executive Director
New England Fishery Management Council
50 Water Street, Mill 2
Newburyport, MA 01950

Dear Paul:

By this letter, NOAA's National Marine Fisheries Service (NMFS), on behalf of the Secretary of Commerce, is notifying the New England Fishery Management Council (Council) that winter skate (*Leucoraja ocellata*) is overfished. NMFS requests that the Council take appropriate action pursuant to section 304(e) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

According to the Northeast Skate Complex Fishery Management Plan (FMP), which became effective September 18, 2003, winter skate is considered to be in an overfished condition when the 3-year moving average of the autumn trawl survey mean weight per tow falls below one-half of the 75th percentile of the mean weight per tow observed in the autumn trawl survey from 1967-1998 (3.23 kg/tow). Based on the information provided to you under separate cover from Dr. Nancy Thompson, Director of the Northeast Fisheries Science Center, the 3-year average from 2004-2006 is 3.04 kg/tow, which is less than the 3.23 kg/tow threshold. Winter skate are therefore considered to be overfished.

The Magnuson-Stevens Act requires that, within 1 year of this notice, the Council prepare a fishery management plan amendment or proposed regulations to address the overfished condition of the overfished stock and to rebuild the stock. I intend to request the assistance of the Northeast Fisheries Science Center regarding options for next steps and make my staff available to discuss this issue with you further.

Sincerely,

Patricia A. Kurkul
Regional Administrator

cc: Dr. Nancy Thompson, NEFSC
Alan Risenhoover

2. Document 2

Skate status report using 2007 survey data
June 2008

UPDATE OF SKATE STOCK STATUS BASED ON NEFSC SURVEY DATA THROUGH AUTUMN 2007

There are seven species of skates occurring along the North Atlantic coast of the United States: winter skate (*Leucoraja. ocellata*), little skate (*L. erinacea*), barndoor skate (*Dipturus laevis*), thorny skate (*Amblyraja radiata*), smooth skate (*Malacoraja senta*), clearnose skate (*Raja eglanteria*), and rosette skate (*L. garmani*). Skates are currently managed under the New England Fishery Management Council's Skate Fishery Management Plan implemented in 2003. This plan includes mandatory reporting by species; possession prohibitions on barndoor, thorny, and smooth skates; trip limits for winter skate; and a suite of measures in other fisheries management plans to aid in the recovery of the overfished skate species.

Indices of relative abundance (stratified mean weight per tow) have been developed from NEFSC bottom trawl surveys for the seven species in the skate complex, and these form the basis for most of the conclusions about the status of the complex. All statistically significant NEFSC gear, door, and vessel conversion factors were applied to little, winter, and smooth skate indices when applicable. The strata sets used for each species are given in Table 1.

Biomass reference points are based entirely on NEFSC survey data since reliable landings and discard information are not available by species. For all species but barndoor, the Bmsy proxy is defined as the 75th percentile of the appropriate survey biomass index time series for that species (**Table 1**). For barndoor skate, the Bmsy proxy is the average of 1963-1966 autumn survey biomass indices since the survey did not catch barndoor for a protracted period.

The fishing mortality reference points are based on changes in survey biomass indices. If the three-year moving average of the survey biomass index for a skate species declines by more than the average CV of the survey time series, then fishing mortality is assumed to be greater than Fmsy and overfishing is occurring for that skate species. The average CVs of the indices are given by species in **Table 1**.

For winter skate, the 2005-2007 NEFSC autumn average biomass index of 2.93 kg/tow is below biomass threshold reference point (3.23 kg/tow), and thus the species remains overfished. The 2005-2007 average index is below the 2004-2006 index by 4%, but overfishing is not occurring as this decline is less than the 20% reference decline level.

For little skate, the 2005-2007 NEFSC spring average biomass index of 3.67 kg/tow is above the biomass threshold reference point (3.27 kg/tow), and thus the species is not overfished. The 2005-2007 average index is lower than the 2004-2006 index by 20%, but overfishing is not occurring as this decline is not below 20%.

For barndoor skate, the 2005-2007 NEFSC autumn average survey biomass index of 1.00 kg/tow is above the biomass threshold reference point (0.81 kg/tow), and thus the species is not overfished, but is not yet rebuilt to Bmsy. The 2005-2007 average index is below the 2004-2006 index by 14%, but overfishing is not occurring as this decline is less than the 30% reference decline level.

For thorny skate, the 2005-2007 NEFSC autumn average biomass index of 0.42 kg/tow is well below the biomass threshold reference point (2.20 kg/tow), indicating that the species is in an

	BARNDOOR	CLEARNOSE	LITTLE	ROSETTE	SMOOTH	THORNY	WINTER
Survey (kg/tow) Time series basis Strata Set	Autumn 1963-1966 Offshore 1-30, 33-40	Autumn 1975-1998 Offshore 61-76, Inshore 15-44	Spring 1982-1999 Offshore 1-30, 33-40, 61-76, Inshore 1-66	Autumn 1967-1998 Offshore 61-76	Autumn 1963-1998 Offshore 1-30, 33-40	Autumn 1963-1998 Offshore 1-30, 33-40	Autumn 1967-1998 Offshore 1-30, 33-40, 61-76
1997	0.11	0.61	2.71	0.01	0.23	0.85	2.46
1998	0.09	1.12	7.47	0.05	0.03	0.65	3.75
1999	0.30	1.05	9.98	0.07	0.07	0.48	5.09
2000	0.29	1.03	8.60	0.03	0.15	0.83	4.38
2001	0.54	1.61	6.84	0.12	0.29	0.33	3.89
2002	0.78	0.89	6.44	0.05	0.11	0.44	5.60
2003	0.55	0.66	6.49	0.03	0.19	0.74	3.39
2004	1.30	0.71	7.22	0.05	0.21	0.71	4.03
2005	1.04	0.52	3.24	0.07	0.13	0.22	2.62
2006	1.17	0.53	3.32	0.06	0.21	0.73	2.48
2007	0.80	0.85	4.46	0.07	0.09	0.32	3.71
2002-2004 3-year average	0.88	0.75	6.72	0.044	0.17	0.63	4.34
2003-2005 3-year average	0.96	0.63	5.65	0.049	0.18	0.56	3.34
2004-2006 3-year average	1.17	0.59	4.59	0.057	0.19	0.55	3.04
2005-2007 3-year average	1.00	0.64	3.67	0.064	0.14	0.42	2.93
Percent change 2005-2007 compared to 2004-2006	-14.2	+8.1	-20.0	+12.7	-22.4	-23.7	-3.6
Percent change for overfishing status determination in FMP	-30	-30	-20	-60	-30	-20	-20
Biomass Target	1.62	0.56	6.54	0.029	0.31	4.41	6.46
Biomass Threshold	0.81	0.28	3.27	0.015	0.16	2.20	3.23
CURRENT STATUS	Not Overfished Overfishing is Not Occurring	Not Overfished Overfishing is Not Occurring	Not Overfished Overfishing is Not Occurring	Not Overfished Overfishing is Not Occurring	Overfished Overfishing is Not Occurring	Overfished Overfishing Is Occurring	Overfished Overfishing is Not Occurring

TABLE 1.

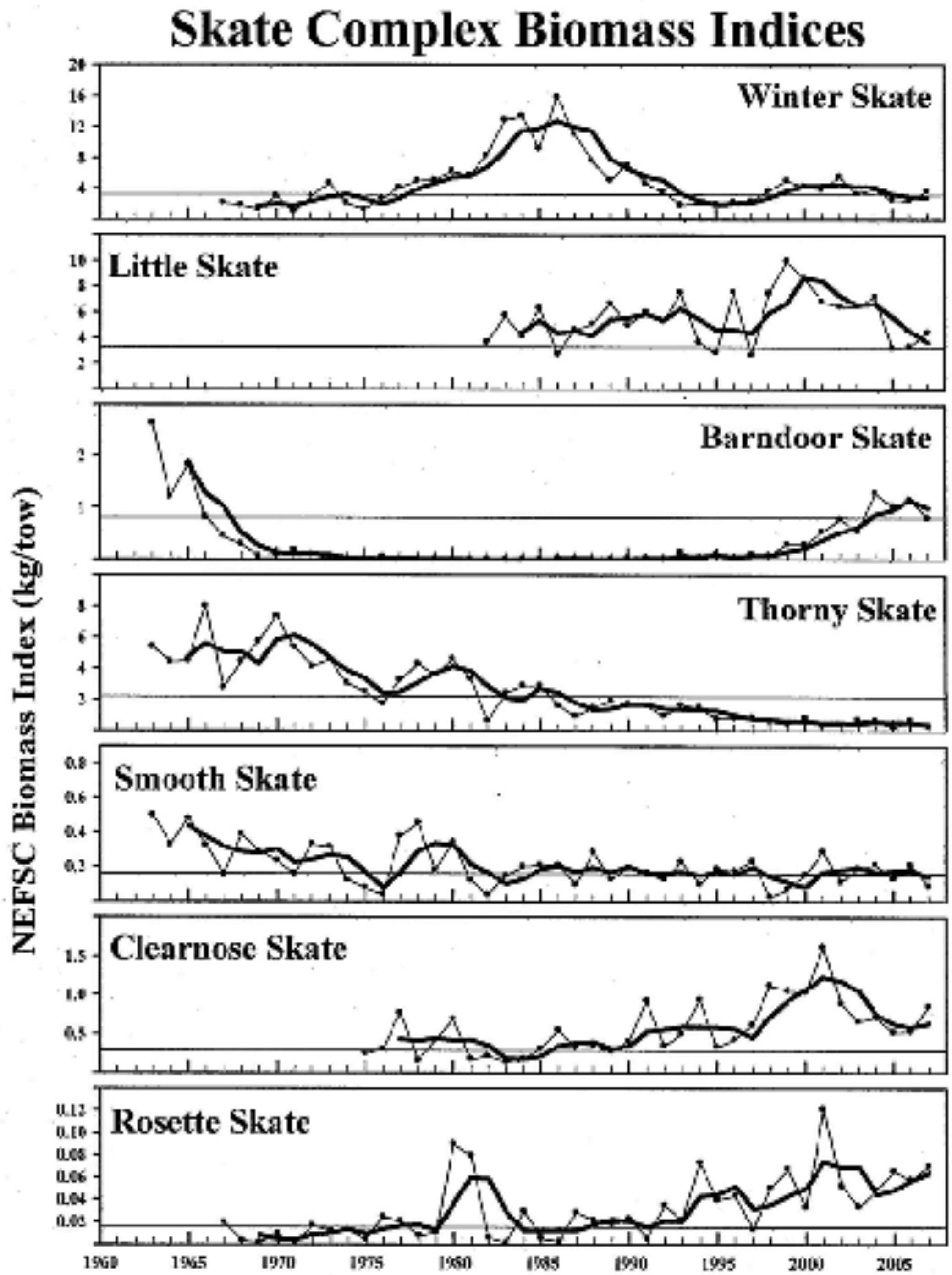


FIGURE 1. NEFSC survey biomass indices (kg/tow). Thin lines with symbols are annual indices, thick lines are 3-year moving averages, and the thin horizontal line are the biomass thresholds.

3. Document 3

Notification of skate overfishing
July 2008

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
One Blackburn Drive
Gloucester, MA 01930-2298

JUL 21 2008

Paul J. Howard, Executive Director
New England Fishery Management Council
50 Water Street, Mill 2
Newburyport, MA 01950

Dear Paul:

By this letter, NOAA's National Marine Fisheries Service (NMFS), on behalf of the Secretary of Commerce, is notifying the New England Fishery Management Council (Council) that it has been determined that smooth skate (*Malacoraja senta*) is overfished, and thorny skate (*Amblyraja radiata*) is now subject to overfishing (see Attachment).

According to the Northeast Skate Complex Fishery Management Plan (FMP), smooth skate is considered to be in an overfished condition when the 3-year moving average of the autumn trawl survey mean weight per tow falls below ½ of the 75th percentile of the survey time series from 1963-1998 (0.16 kg). Based on information provided by Dr. Nancy Thompson, Director of the Northeast Fisheries Science Center (Center), the 3-year average for 2005-2007 is 0.14 kg/tow, which is less than the 0.16-kg/tow threshold. Smooth skate is therefore considered to be overfished.

Thorny skate is considered to be subject to overfishing when the percent decline between consecutive 3-year moving averages of the autumn trawl survey mean weight per tow is 20 percent or more. Based on information provided by the Center, the 3-year mean weight per tow for thorny skate was 0.42 kg during 2005-2007, which is a 23.7-percent decline from 0.55 kg during 2004-2006. Thorny skate is therefore subject to overfishing.

The Center also provided new preliminary spring trawl survey data for 2006-2008 (5.04 kg/tow), which indicate that overfishing of little skate (*Leucoraja erinacea*) is likely not occurring (see Attachment).

Pursuant to Section 304(e)(3) of the Magnuson-Stevens Fishery Conservation and Management Act, the Council is required, within 1 year of this notice, to prepare an FMP amendment to address the overfished condition of smooth skate and to rebuild the stock, and to develop management measures to end overfishing of thorny skate. However, given that current regulations implemented under the Skate FMP already prohibit the possession of thorny skates throughout the Northeast Region, and smooth skates in the Gulf of Maine Regulated Mesh Area, and that an amendment to the Skate FMP is currently under development (Amendment 3), I recommend that these new stock status determinations be addressed within the scope of the amendment in progress. Specifically, the objectives of Amendment 3, originally intended to implement a rebuilding program for winter skate and contribute to the rebuilding of thorny skate, would now also incorporate a rebuilding program for smooth skate and measures to end overfishing of thorny skate.

Additional analyses may be necessary in order to demonstrate that the alternatives under consideration will address the rebuilding of smooth skates, in addition to the other species in need of rebuilding. The amendment would also be required to formalize the rebuilding schedule for smooth skate. Presumably, these potential changes would not further delay the completion of Amendment 3, and would be reviewed by the Skate Oversight Committee prior to presentation to the Council.

Please contact me if you have any questions with these revised status determinations.

Sincerely,

Patricia A. Kurkul
Regional Administrator

Attachments

cc: J. Pappalardo
C. Kellogg
A. Applegate

4. Document 4

Analysis of catch limits to rebuild skate biomass

New England Fishery Management Council
50 WATER STREET | NEWBURYPORT, MASSACHUSETTS 01950 | PHONE 978 465 0492 | FAX 978 465 3116
John Pappalardo, *Chairman* | Paul J. Howard, *Executive Director*

MEMORANDUM

DATE: **March 3, 2008**

TO: Council

FROM: Skate PDT

SUBJECT: **A heuristic approach to identification of precautionary catch limits to rebuild skates**

Although analytic models have not yet gained approval for skate assessment and management, the Science and Statistical Committee recommended a more basic, adaptive approach to setting rebuilding catch limits. One way to examine this is to use a heuristic approach to examine the correlation between biomass, rates of biomass change, and catch. The most traditional way that this is done is with a surplus production model, like ASPIC, but use of these models to assess skates and estimate MSY have met with difficulties due primarily to catch identification problems.

The Council has directed the PDT to develop precautionary catch limits or targets to meet the amendment objectives, preventing overfishing and rebuilding winter and thorny skates. Lacking scientific data, the PDT is being directed to develop catch limit and target recommendations based on a qualitative assessment.

The attached figures show a relationship and estimate a correlation coefficient between skate catch and changes in survey biomass (fall for winter and thorny skates, spring for little), hopefully to identify a limit where biomass is more likely to increase than it is to decline. Setting a limit on this basis will not yield a probability of achieving a rebuilding objective in a specific period of time, of course.

The following figures show relationships between various forms of catch and survey biomass for winter, thorny, and little skates. The survey that the Council adopted for status determinations were used to calculate changes in total biomass: the fall survey for winter and thorny skates, the spring survey for little skate. Winter and thorny skates were examined because they are overfished and a rebuilding plan is required.

The results are arranged the same way for each of the three species, four figures to a page. For the SSC and Oversight Committee, only the results related to PDT recommendations will be selected and summarized. But given the problems with species identification in the landings, unknown species composition of discards, unknown discard mortality, and the possibility of non-equilibrium conditions causing lags in response to high or low catches, it was worth examining the relationships from a variety of heuristic approaches.

The first set of four figures on the first page of each species profile shows the relationship between various types of annual skate landings and annual changes in biomass. Landings in the same year of the survey were used for fall surveys (winter and thorny skate) and from the prior year for the spring survey (little skate). In each figure, a regression line and correlation coefficient are shown. The size of the data points represents total survey biomass for a given species and the distance above and below the Y-axis origin represents the year to year change in the biomass value. The data point associated with the 2006 survey (the latest presently available) is shown in red (dark on B&W copies). Each data point is labeled with the terminal survey year which it represents.

The upper left figure shows the relationship between whole skate landings and changes in biomass. This is particularly germane to little skate which are targeted for the bait fishery and landed whole. The upper right figure shows the relationship between wing skate landings and changes in biomass, particularly applicable to winter skate. The lower left figure shows the relationship between total skate landings and changes in biomass. And the lower right figure shows the relationship between total landings plus discards (25% mortality rate assumed) and annual changes in the survey biomass index.

The panel of figures on the second page of each species profile (such as Figure 2 for winter skate) shows the relationship between three years of landings or catch and the three year moving average of biomass. These figures therefore show the relationship over a longer time frame which smooths some of the inter-annual variability that may be characteristic of the survey data.

The panel of figures on the third page associates a scaled catch/biomass ratio (i.e. an exploitation index) with changes in biomass, using whole skate landings, wing skate landings, total skate landings, and total skate landings plus discards to represent catch. Like the data above, a 3 year moving average was applied as a smoother. Because biomass is in the denominator of the catch/biomass exploitation index, years with higher survey biomass tend to have low catch/biomass exploitation values and the correlation coefficient is more likely to be higher, but may not be significant for this reason.

The panel of figures on the fourth page (such as Figure 4 for winter skate) use landings that have been associated with the species based on the proportion of exploitable survey biomass found in each statistical area and trimester (winter, spring, and fall surveys). The figure in the lower right shows the time trend in annual and the 3 year moving averages of catch/biomass and biomass. The biomass threshold that determines when the species is overfished is also shown.

The next panel on the fifth page shows the relationship between catch (landings of a species plus 25% discard mortality) using lags between the two ranging from 0 to 3 years. The panel of figures on page six examines the relationship between catch and biomass, with assumed discard mortality ranging from 10 to 75 percent.

The last set of figures on the seventh page (Figure 7 for winter skate) shows the trend in mean size for each survey, with the size of the data points representing stratified mean abundance. Declines in mean size which are associated with high abundance are the result of a strong incoming year class, which is usually followed by an increase in mean size as the fish grow. High abundance and large mean size is associated with high biomass. Declines in mean size accompanied by no trend or decline in abundance is often symptomatic and age truncation of the stock and overfishing

Winter skate summary

There appear to be no correlation between landings and changes in annual biomass (Figure 1) or between landings and a 3 year biomass moving average (Figure 3). There seems to be a better relationship between total catch and changes in biomass when discards for the Georges Bank and Southern New England region are included in the analysis.

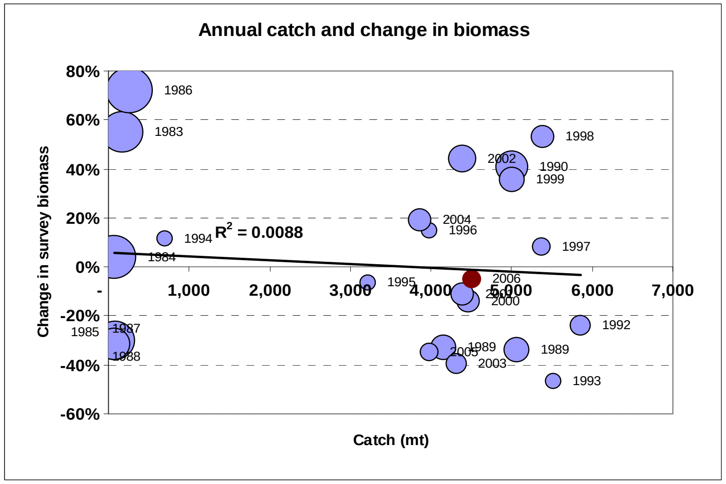
When the landings that were allocated to species based on VTR and survey data are used, the relationship appears to improve between total catch (winter flounder landings and total discards) and changes in survey biomass (Figure 4). There is a relatively high correlation between catch or exploitation and changes in biomass. High catches or exploitation (C/B) are usually associated with decreases in biomass.

The PDT may want to consider and recommend that a catch limit for a winter skate program should be established below about 18,000 mt (winter skate landings and 25% of total discards for the Georges Bank/Southern New England region) AND no more than a catch/biomass ratio equal to 4. Below these levels, it appears that there is a much greater probability of increasing biomass than when catch is above these levels.

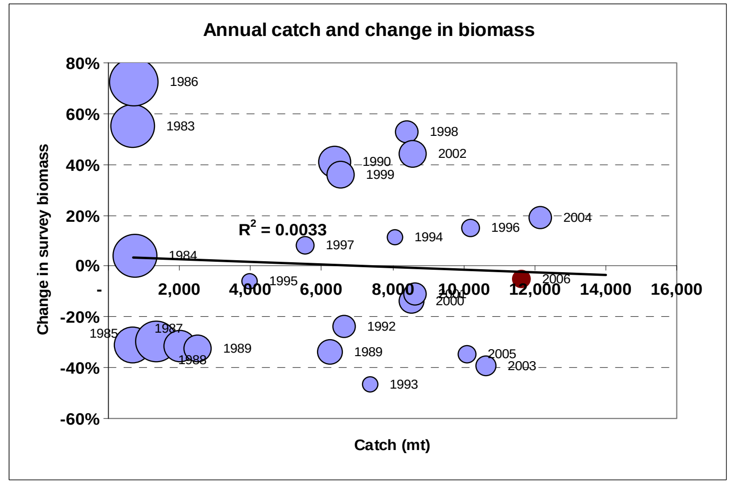
All three surveys exhibit recent declines in abundance. The spring and fall surveys also show declines in mean size since 2002 (Figure 7). Taken together, these trends are consistent with excess catch levels and overfishing.

Figure 1. Annual change in fall survey biomass for winter skate as a function of skate complex landings or catch in the same year as the survey occurred. The size of the data points are proportional by area to the stratified mean weight. The dark (red) data point represents the 2006 survey and 2006 catch/landings. A linear trend line and correlation coefficient are shown.

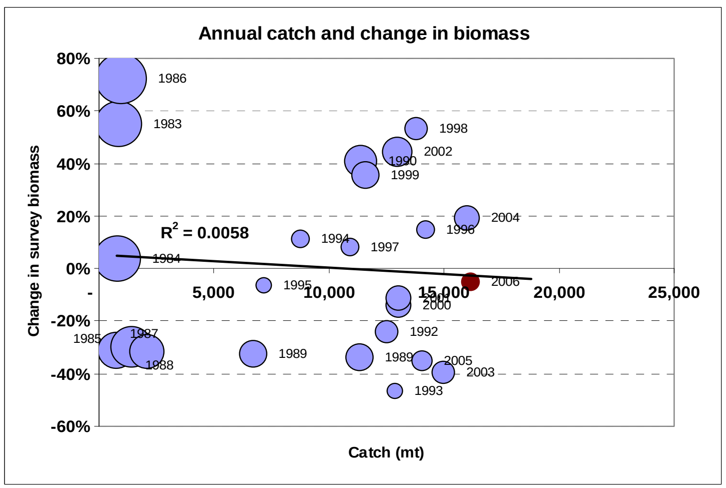
Catch = Whole landings only



Catch = Wing landings only



Catch = Total landings



Catch = Total landings + Discards (25% mortality)

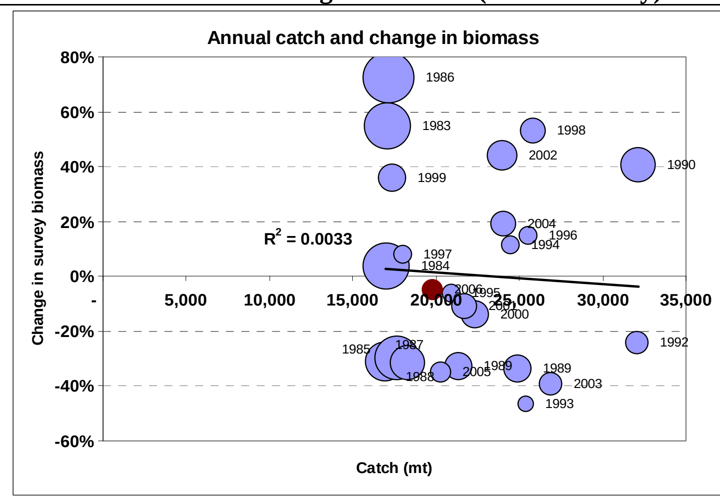
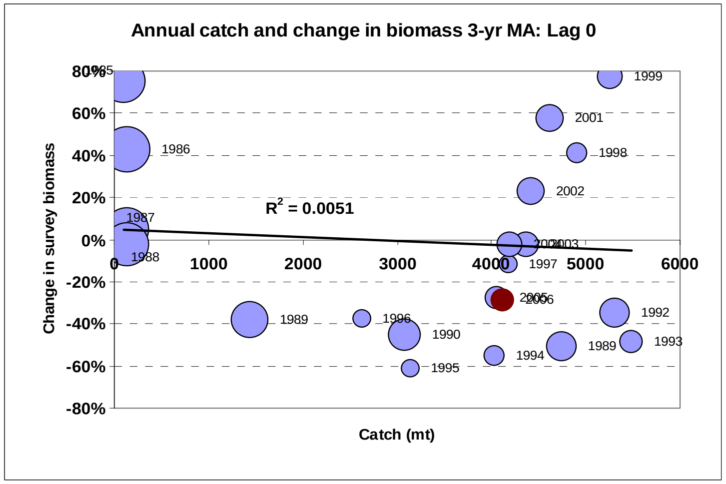
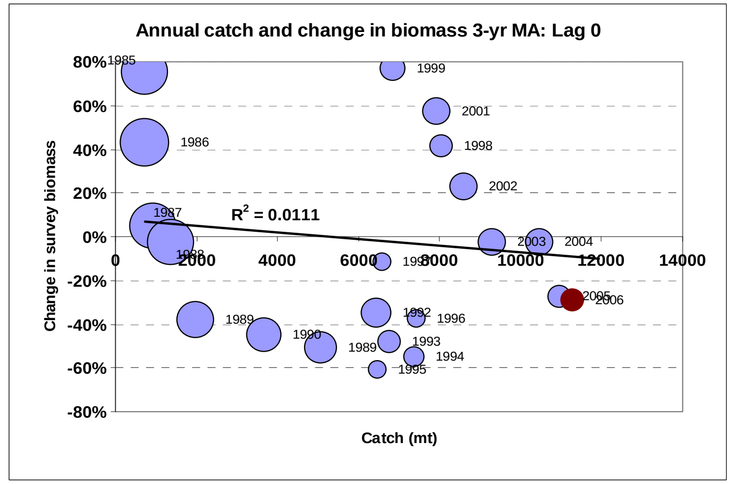


Figure 2. Annual change in fall survey biomass (3 year moving average) for winter skate as a function of skate complex landings (3 year moving average). The size of the data points are proportional by area to the stratified mean weight. The dark (red) data point represents the 2004-2006 survey and 2004-2006 catch/landings. A linear trend line and correlation coefficient are shown.

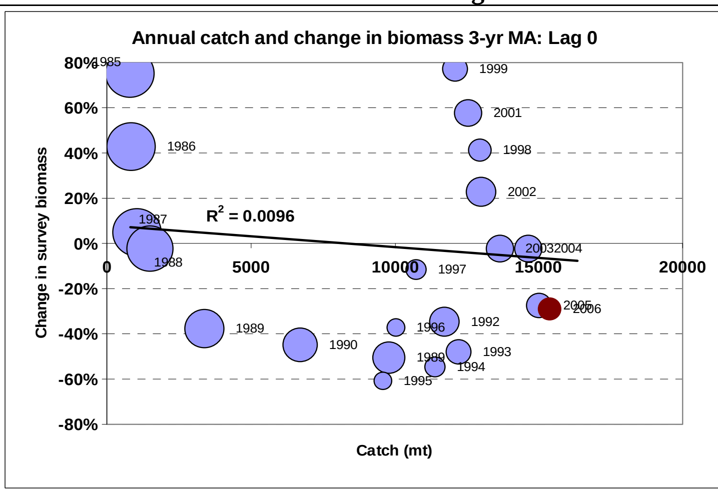
Catch = Whole landings only



Catch = Wing landings only



Catch = Total landings



Catch = Total landings + Discards (25% mortality)

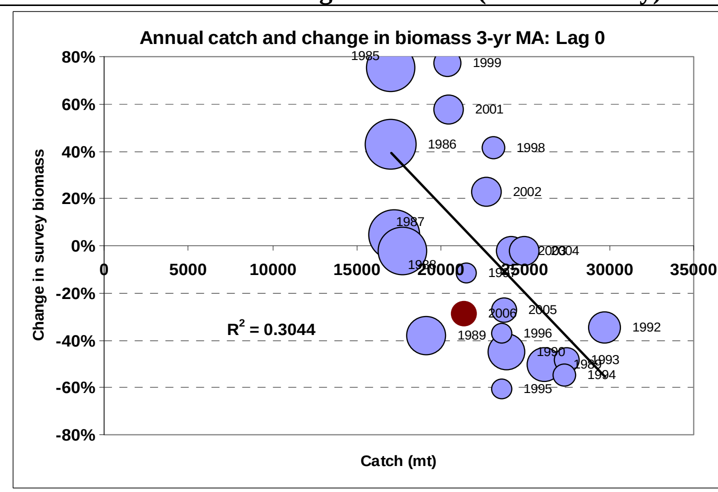


Figure 3. Annual change in fall survey biomass (3 year moving average) for winter skate as a function of exploitation (3 year moving average catch/biomass). The size of the data points are proportional by area to the stratified mean weight. The dark (red) data point represents the 2004-2006 survey biomass and 2004-2006 exploitation index. A linear trend line and correlation coefficient are shown.

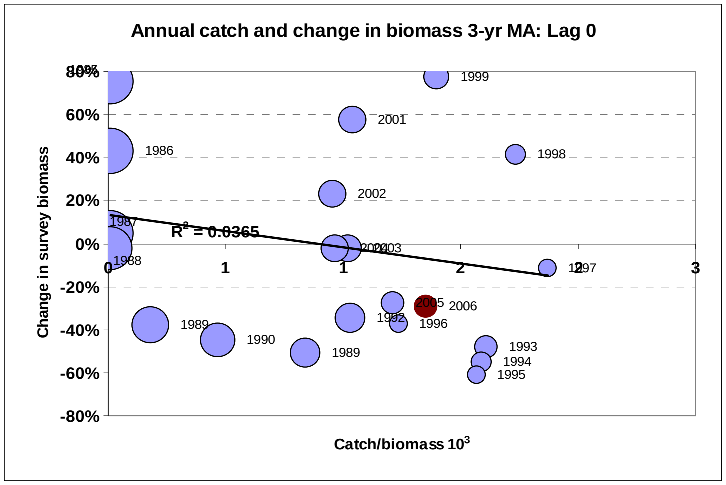
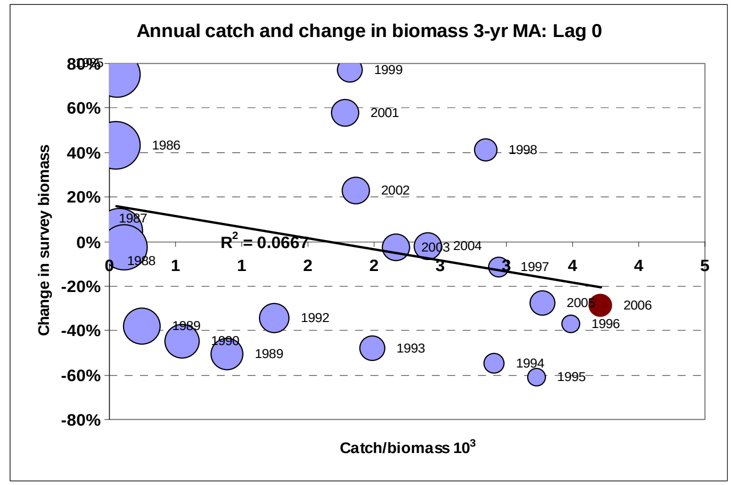
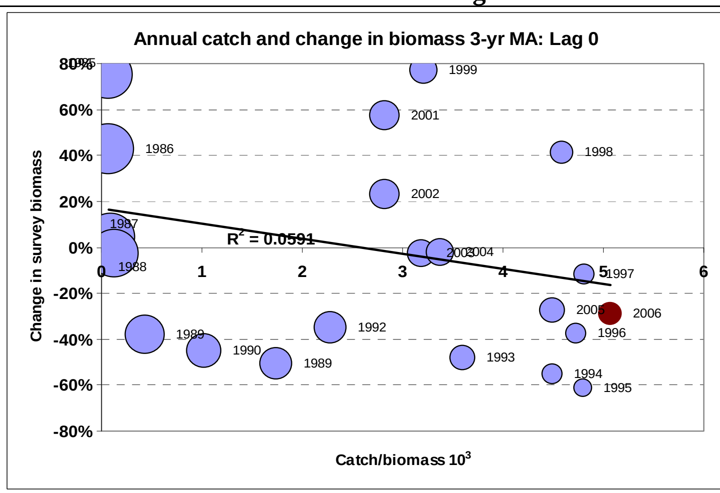
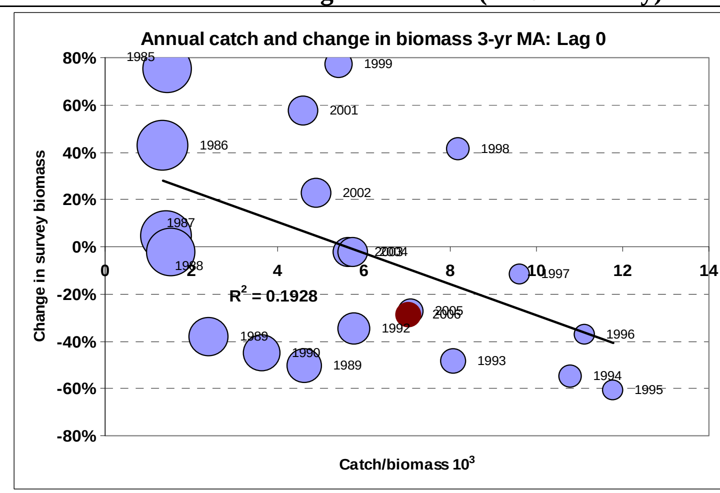
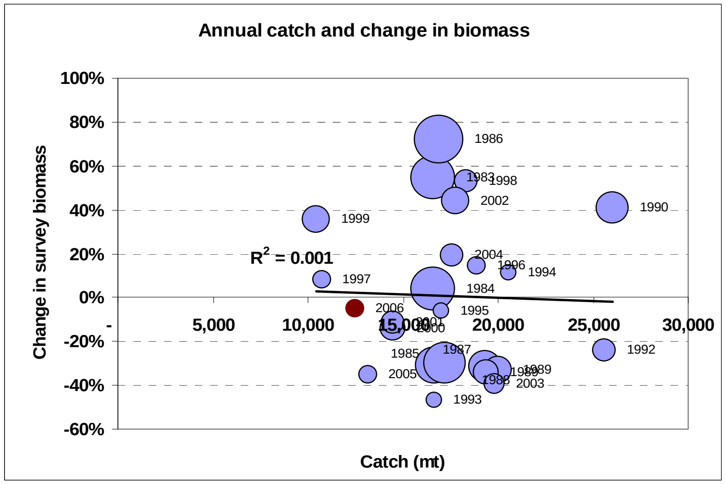
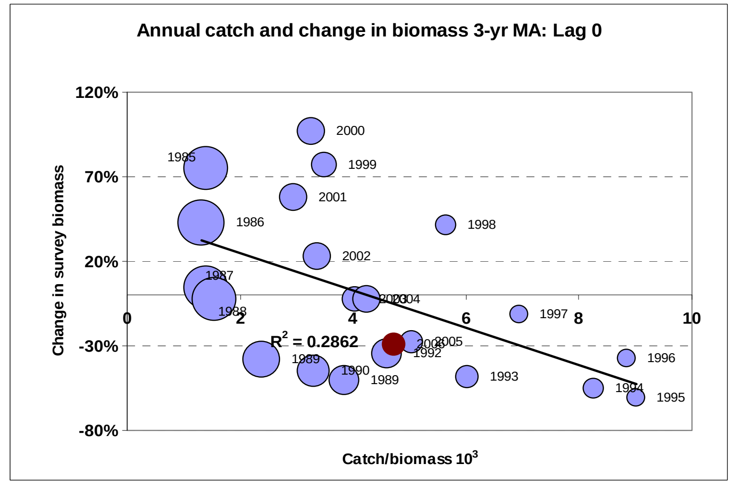
Catch = Whole landings only	Catch = Wing landings only
	
Catch = Total landings	**Catch = Total landings + Discards (25% mortality)**
	

Figure 4. Annual change in fall survey biomass (3 year moving average) for winter skate as a function of exploitation (3 year moving average catch/biomass). Landings data are allocated by species based on proportions of exploitable size skates in the survey data. The size of the data points are proportional by area to the stratified mean weight. The dark (red) data point represents the 2004-2006 survey biomass and 2004-2006 exploitation index. A linear trend line and correlation coefficient are shown.

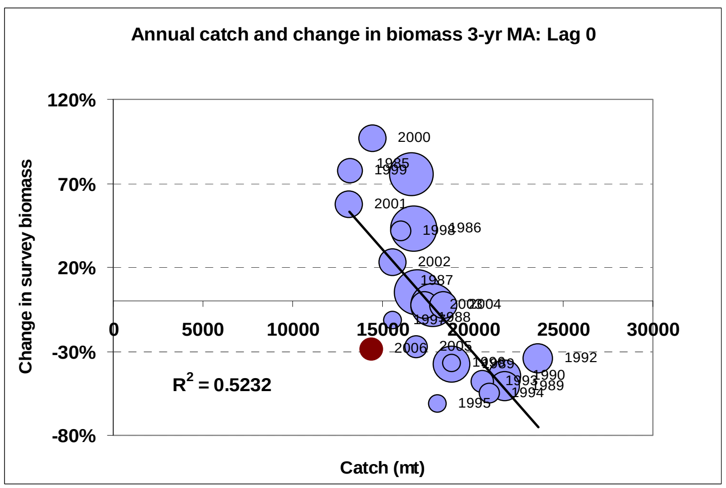
Annual catch vs. biomass, no lag



Catch/biomass ratio vs. 3 yr MA biomass



Annual catch vs. 3 yr MA biomass, no lag



Trend in catch/biomass ratio vs. 3 yr MA biomass

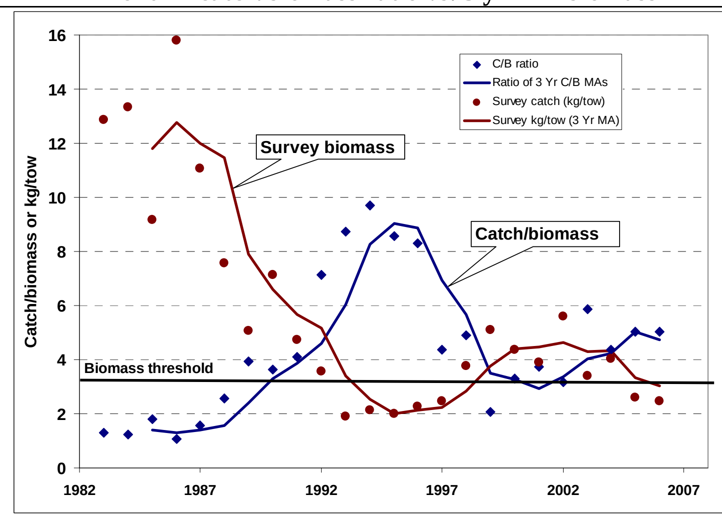
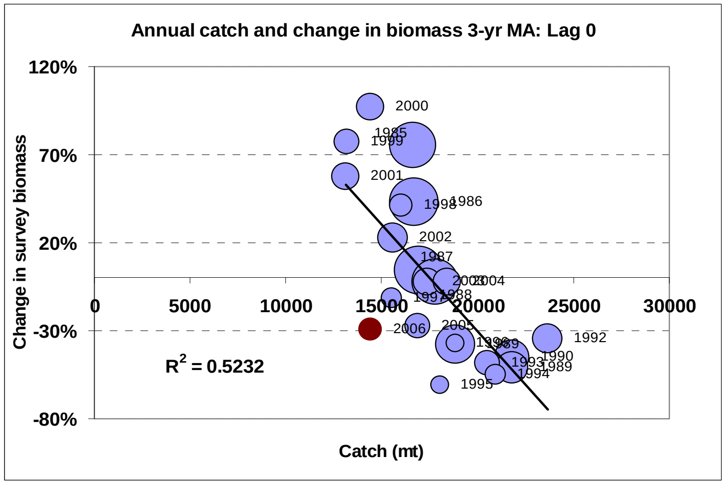
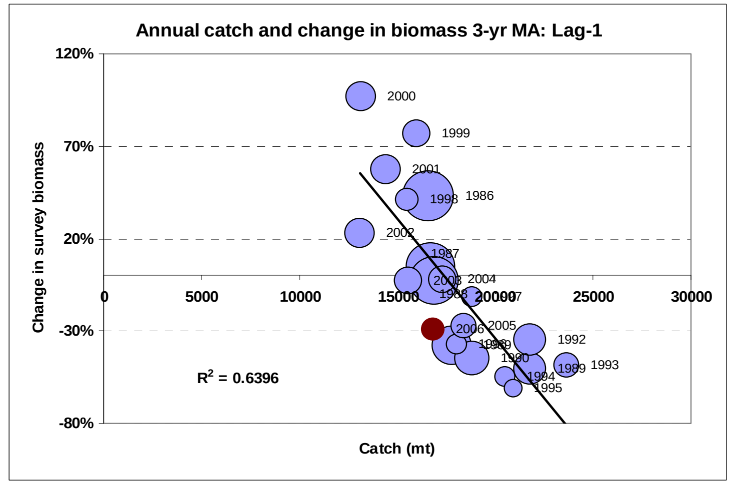


Figure 5. Annual change in fall survey biomass (3 year moving average) for winter skate as a function of skate complex landings (3 year moving average). Landings data are allocated by species based on proportions of exploitable size skates in the survey data. The size of the data points are proportional by area to the stratified mean weight. The dark (red) data point represents the 2004-2006 survey and lagged catch/landings (3 year moving average). A linear trend line and correlation coefficient are shown.

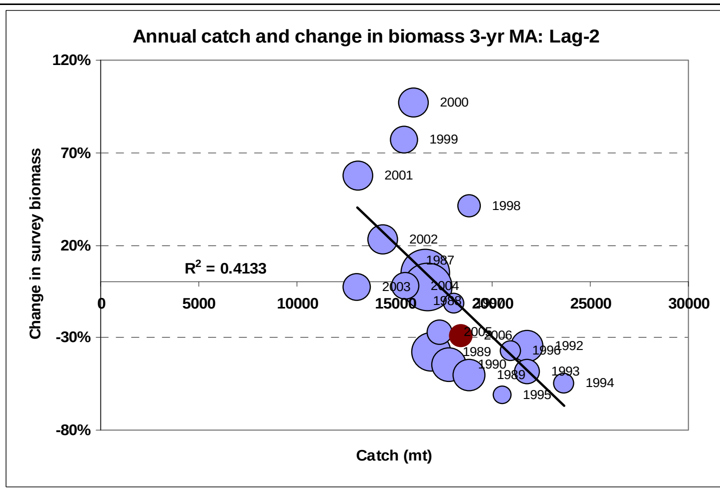
2004-2006



2003-2005



2002-2004



2001-2003

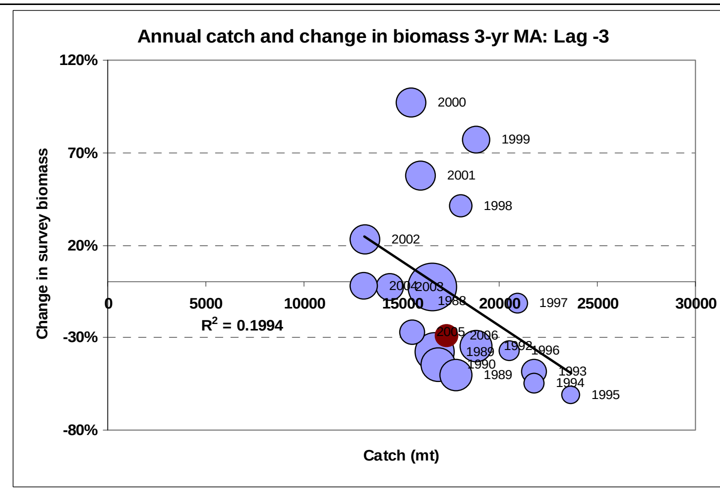
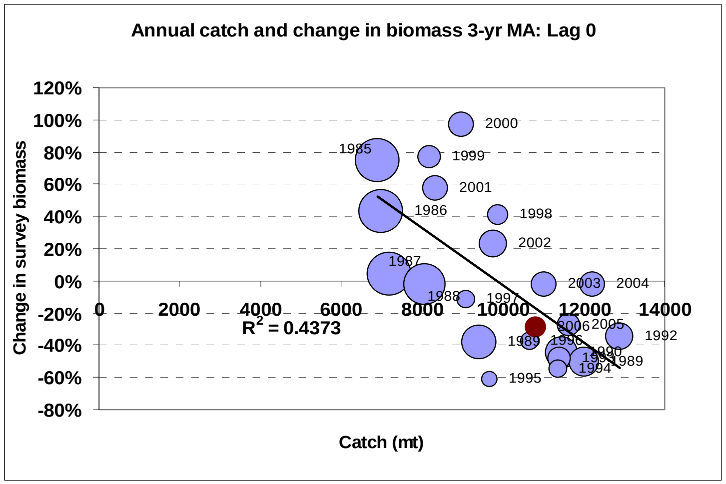
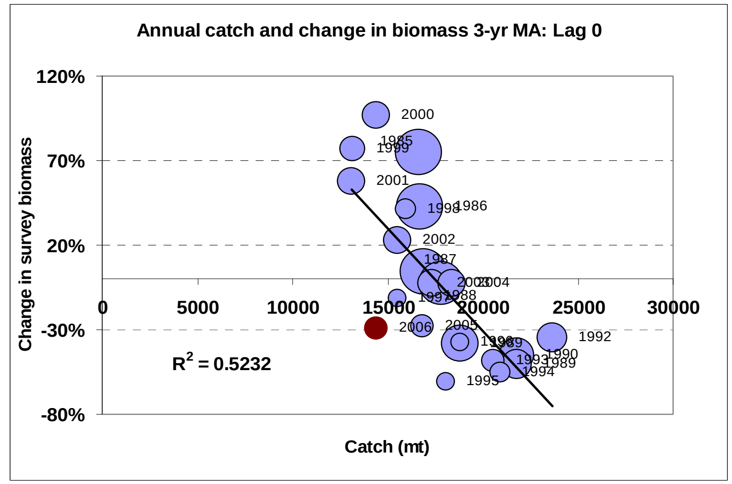


Figure 6. Annual change in fall survey biomass (3 year moving average) for winter skate as a function of skate complex landings (3 year moving average) and discard mortality. Landings data are allocated by species based on proportions of exploitable size skates in the survey data. The size of the data points are proportional by area to the stratified mean weight. The dark (red) data point represents the 2004-2006 survey and lagged catch/landings (3 year moving average). A linear trend line and correlation coefficient are shown.

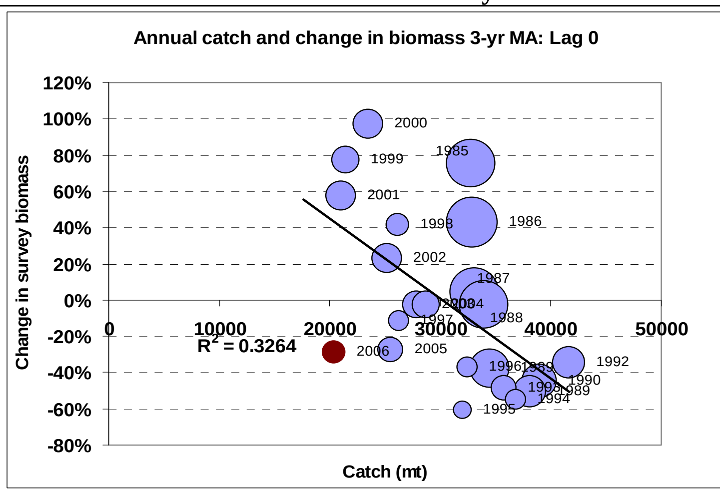
10% discard mortality



25% discard mortality



50% discard mortality



75% discard mortality

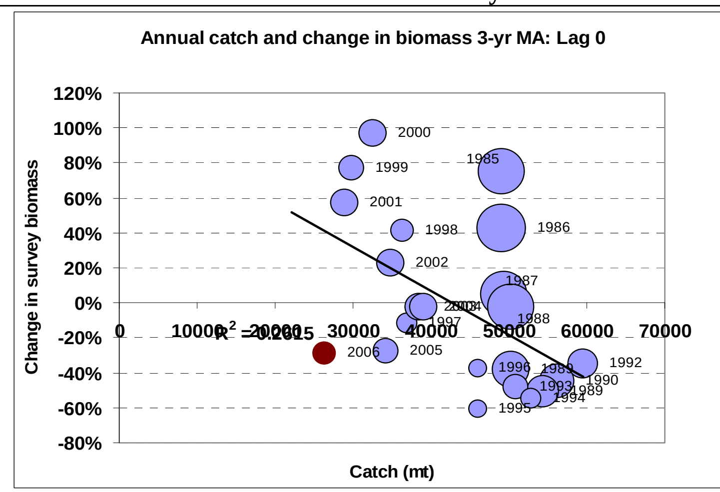
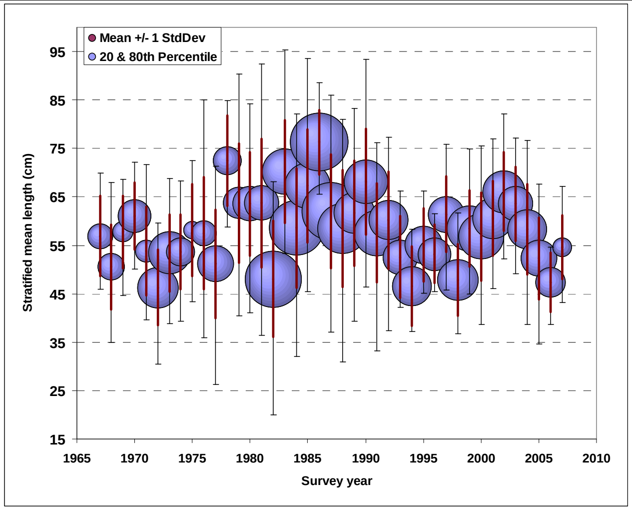
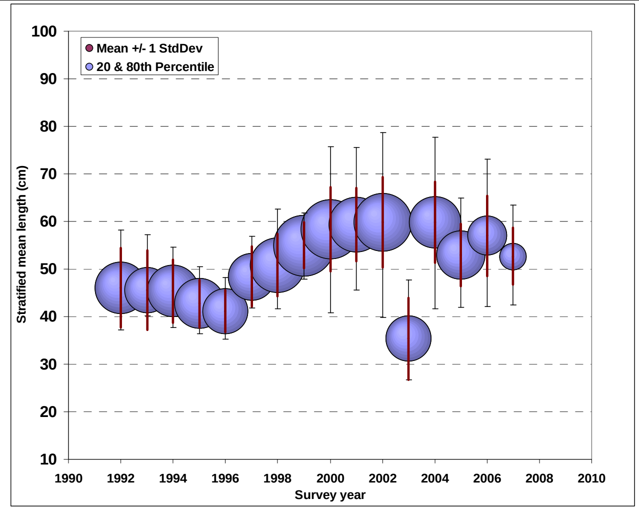


Figure 7. Trend in stratified mean length of winter skate by survey, showing one standard deviation and the 20th and 80th percentiles. The size of the data point is scaled to stratified mean abundance.

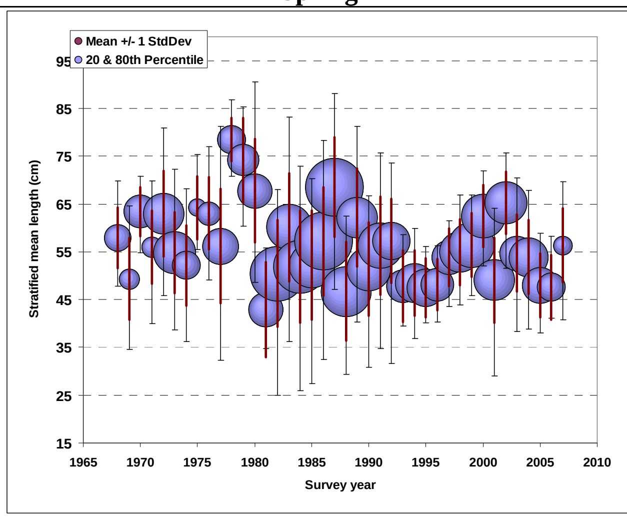
Fall



Winter



Spring



Thorny skate summary

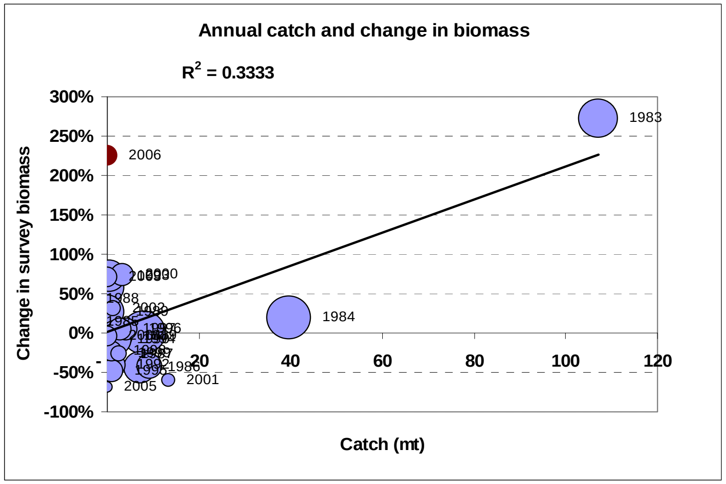
Thorny skate caught in the fall and spring surveys show a steady decline in both mean size and abundance (Figure 14), with little or no response since landings were prohibited in 2003. In fact, mean size and abundance in the 2006 surveys appears to be the lowest for the entire time series.

The relationship between changes in thorny skate survey biomass and landings (ME & NH) or landings and discards (New England region) has very low correlation to one another (Figure 8). There seems to be a correlation between wing landings in ME and NH and changes in thorny skate biomass (Figure 9), but the amount of landings are low and it makes little sense since thorny skate are not believed to be cut for the wing market due to their small size. The lack of a correlation between changes in biomass and catch does not change whether the analysis employs catch (Figure 8), exploitation (Figure 10), landings allocated based on survey species composition (Figure 11), 3 year moving averages (Figures 9 and 11), with lags introduced (Figure 12), or different assumptions about discard mortality (Figure 13).

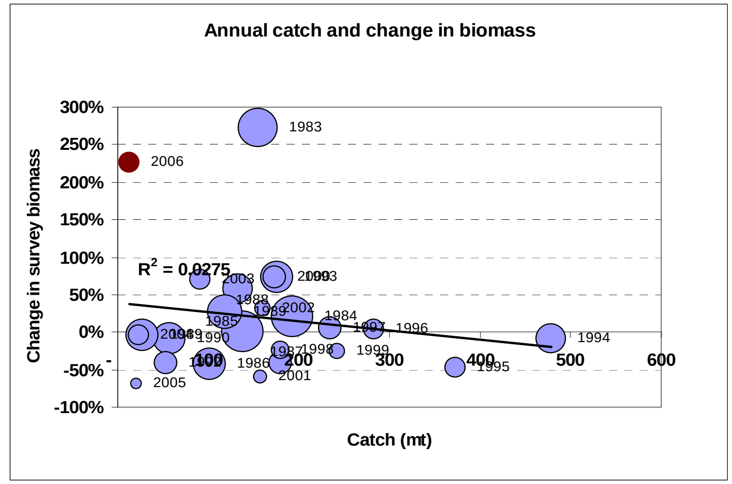
The only thing that might be taken from these data is that there has been a steady decline in mean size and abundance throughout the time series. However, there have been increases in the three year moving average ranging from 5 to 15% during 2004-2006. The PDT may want to recommend that thorny skate catches (landings and discards) be kept below the 2003-2006 level, or lower to enhance rebuilding potential.

Figure 8. Annual change in fall survey biomass for thorny skate as a function of skate complex landings or catch in the same year as the survey occurred. The size of the data points are proportional by area to the stratified mean weight. The dark (red) data point represents the 2006 survey and 2006 catch/landings. A linear trend line and correlation coefficient are shown.

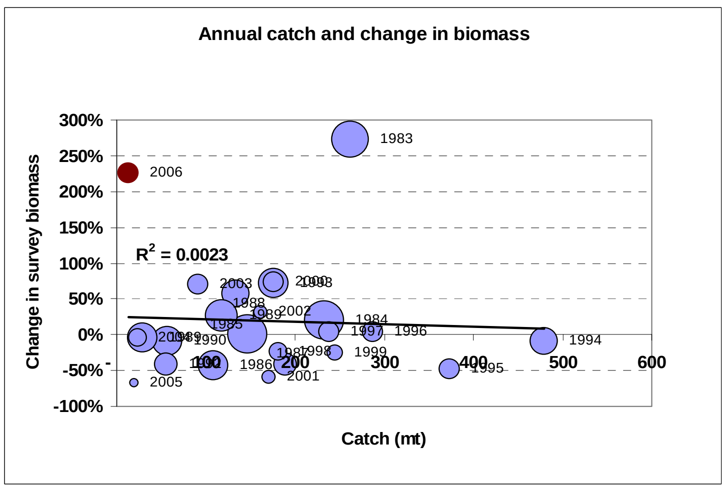
Catch = Whole landings only



Catch = Wing landings only



Catch = Total landings



Catch = Total landings + Discards (25% mortality)

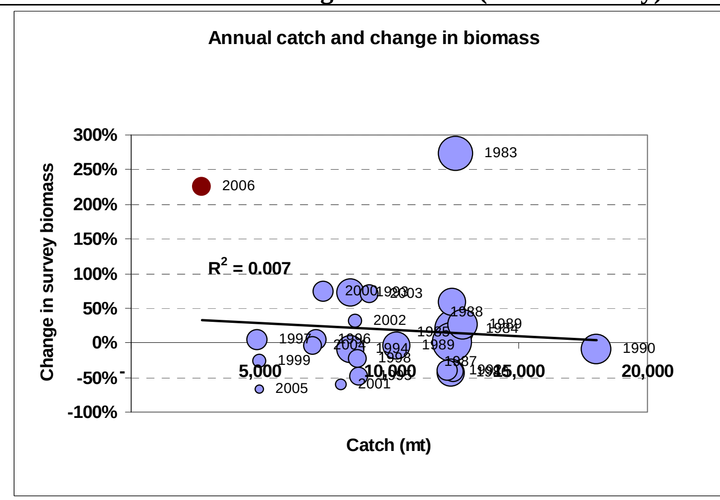
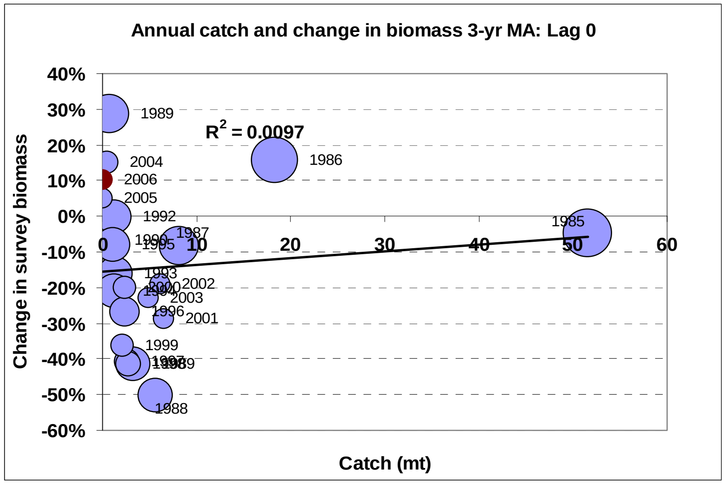
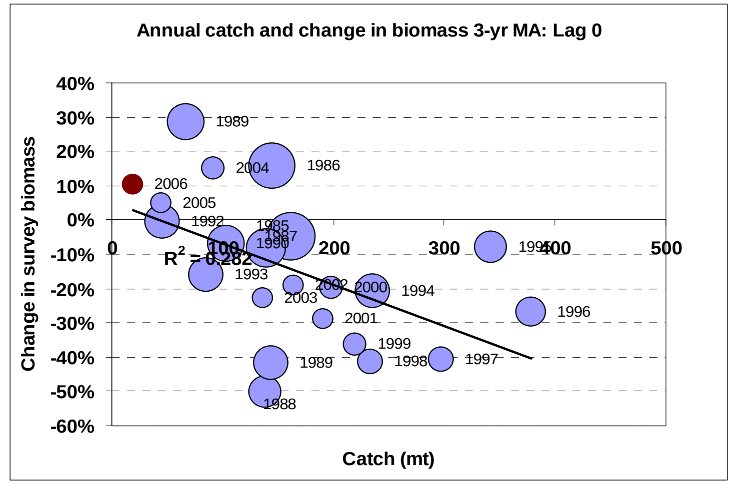


Figure 9. Annual change in fall survey biomass (3 year moving average) for thorny skate as a function of skate complex landings (3 year moving average). The size of the data points are proportional by area to the stratified mean weight. The dark (red) data point represents the 2004-2006 survey and 2004-2006 catch/landings. A linear trend line and correlation coefficient are shown.

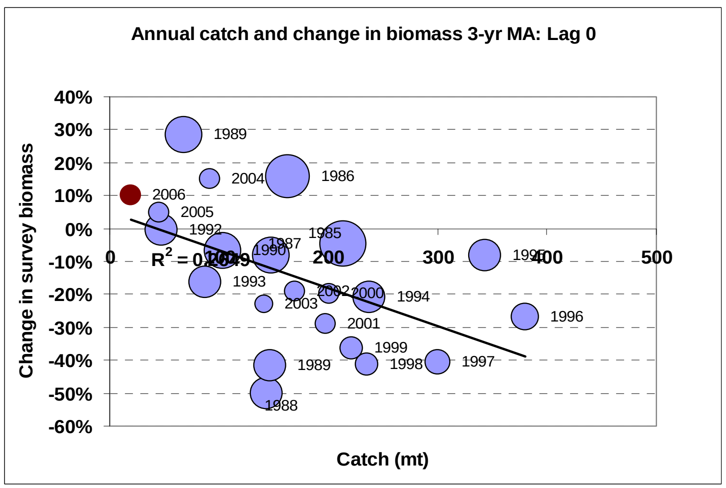
Catch = Whole landings only



Catch = Wing landings only



Catch = Total landings



Catch = Total landings + Discards (25% mortality)

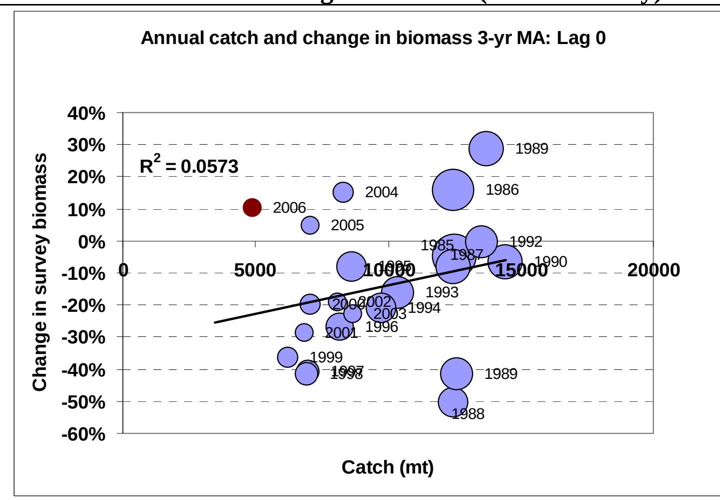


Figure 10. Annual change in fall survey biomass (3 year moving average) for thorny skate as a function of exploitation (3 year moving average catch/biomass). The size of the data points are proportional by area to the stratified mean weight. The dark (red) data point represents the 2004-2006 survey biomass and 2004-2006 exploitation index. A linear trend line and correlation coefficient are shown.

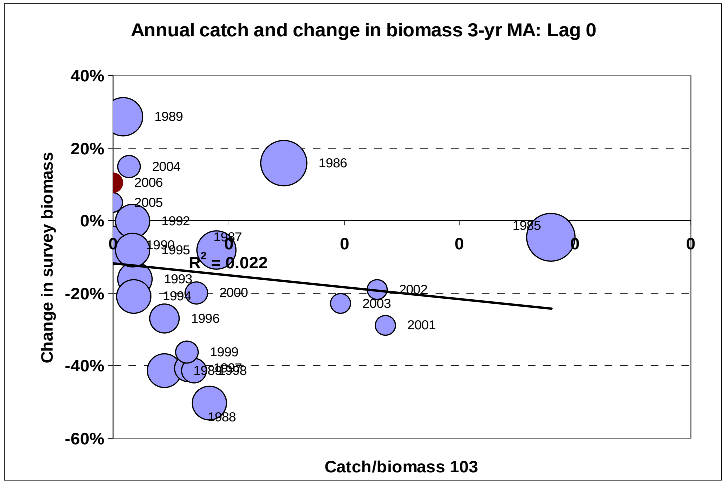
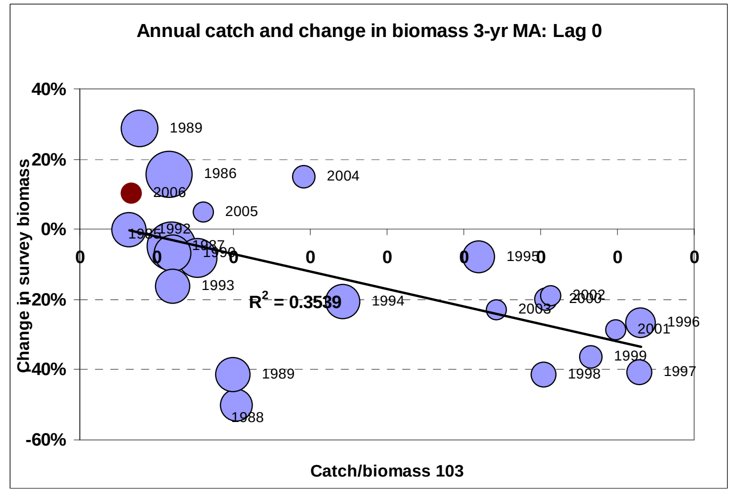
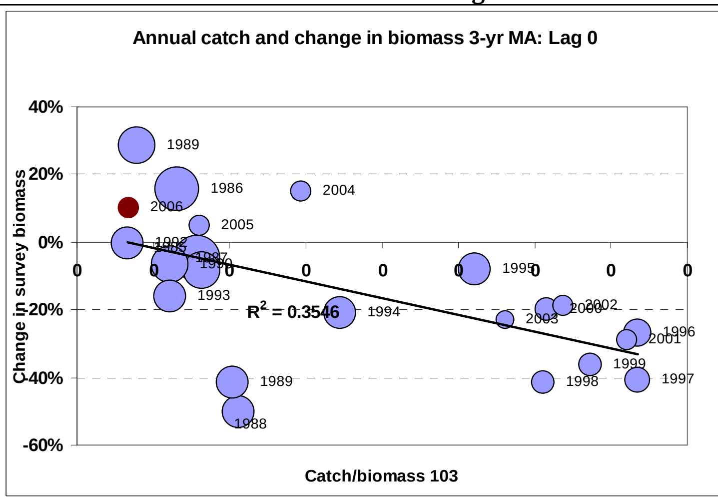
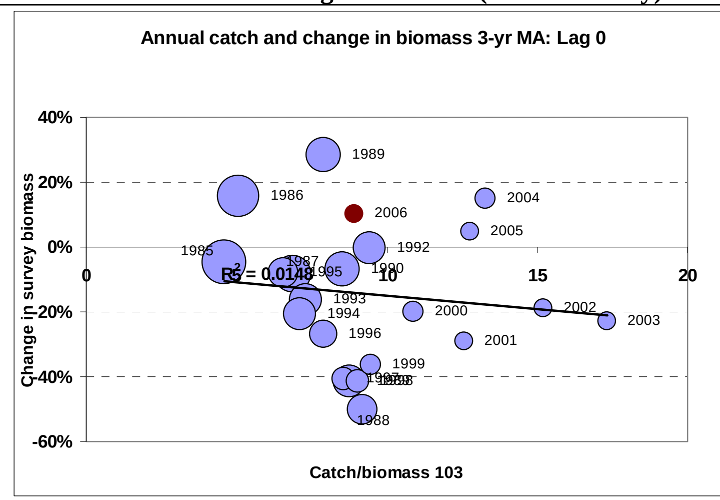
Catch = Whole landings only	Catch = Wing landings only
	
Catch = Total landings	**Catch = Total landings + Discards (25% mortality)**
	

Figure 11. Annual change in fall survey biomass (3 year moving average) for thorny skate as a function of exploitation (3 year moving average catch/biomass). Landings data are allocated by species based on proportions of exploitable size skates in the survey data. The size of the data points are proportional by area to the stratified mean weight. The dark (red) data point represents the 2004-2006 survey biomass and 2004-2006 exploitation index. A linear trend line and correlation coefficient are shown.

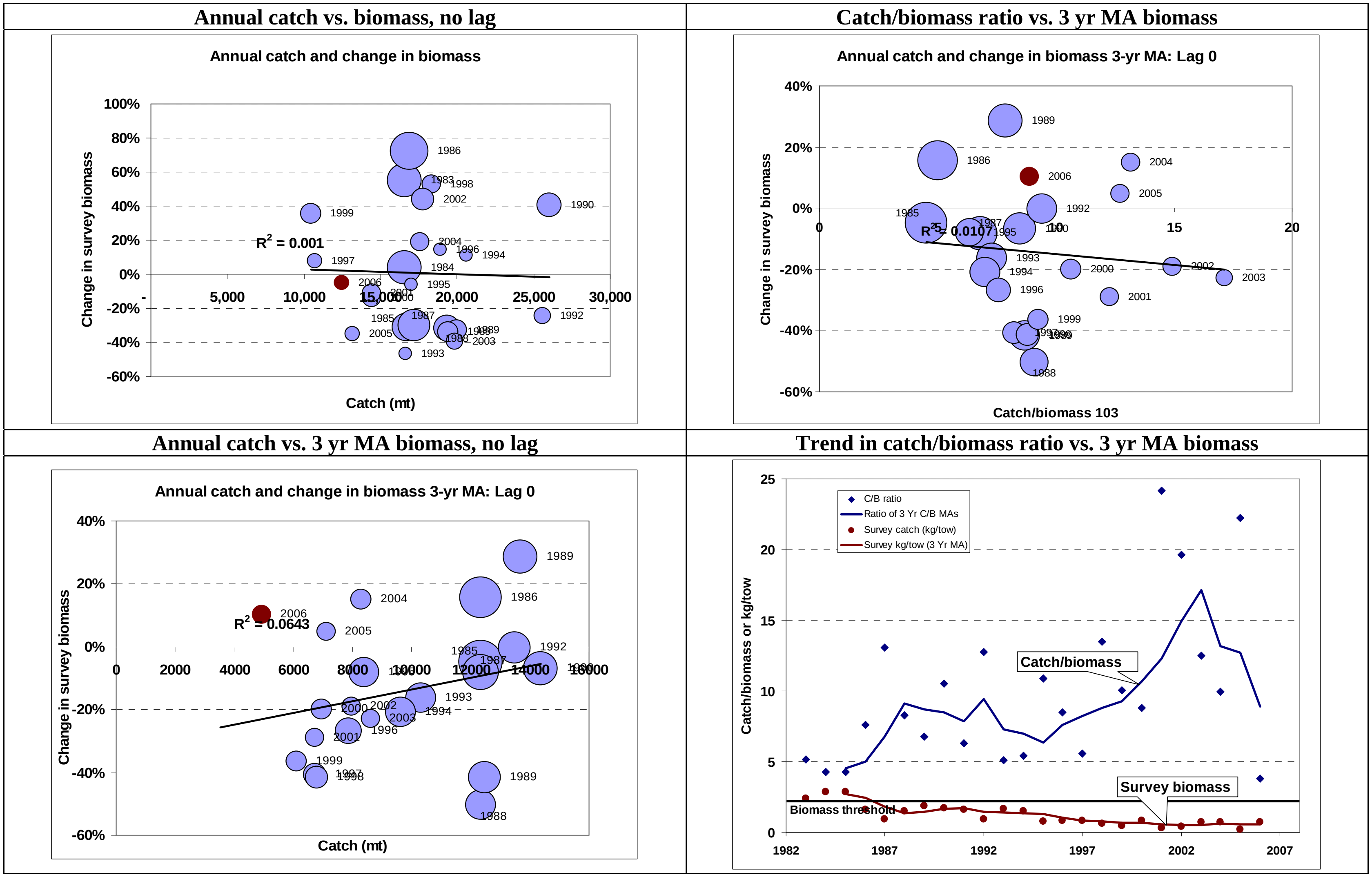
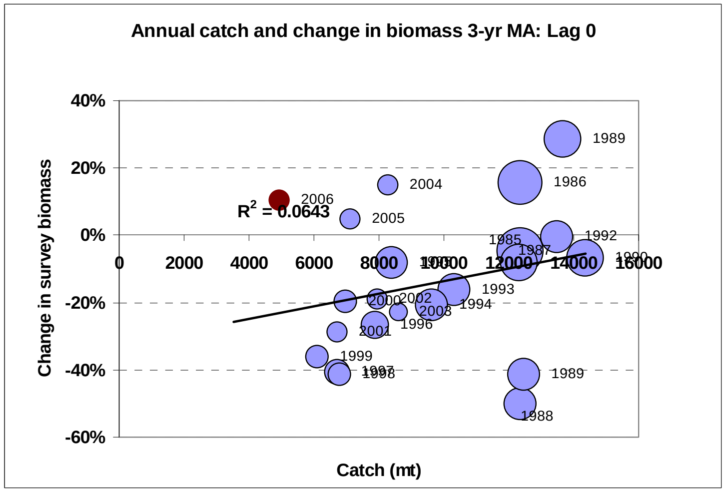
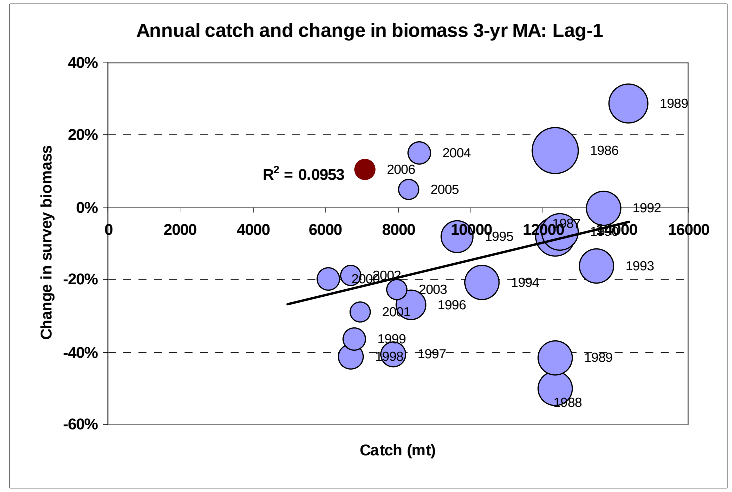


Figure 12. Annual change in fall survey biomass (3 year moving average) for thorny skate as a function of skate complex landings (3 year moving average). Landings data are allocated by species based on proportions of exploitable size skates in the survey data. The size of the data points are proportional by area to the stratified mean weight. The dark (red) data point represents the 2004-2006 survey and lagged catch/landings (3 year moving average). A linear trend line and correlation coefficient are shown.

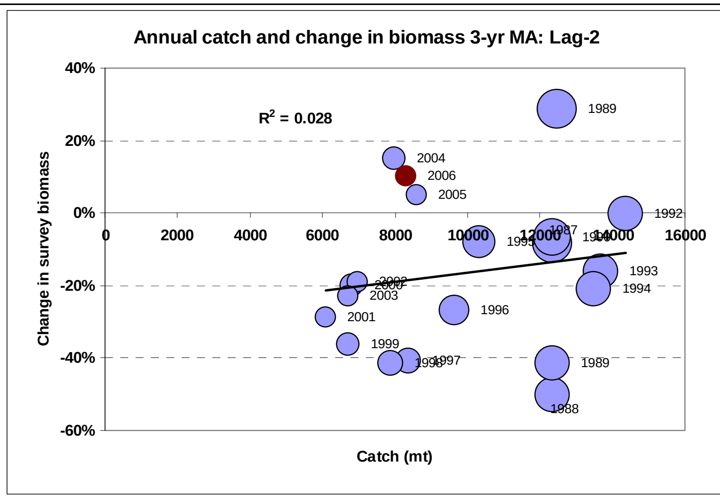
2004-2006



2003-2005



2002-2004



2001-2003

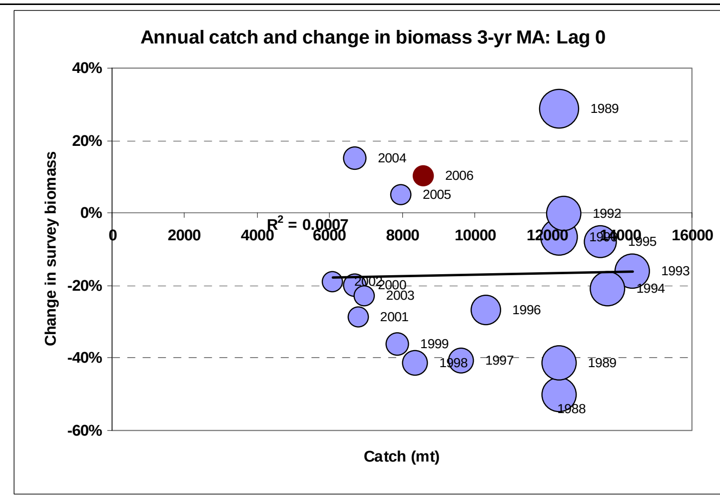
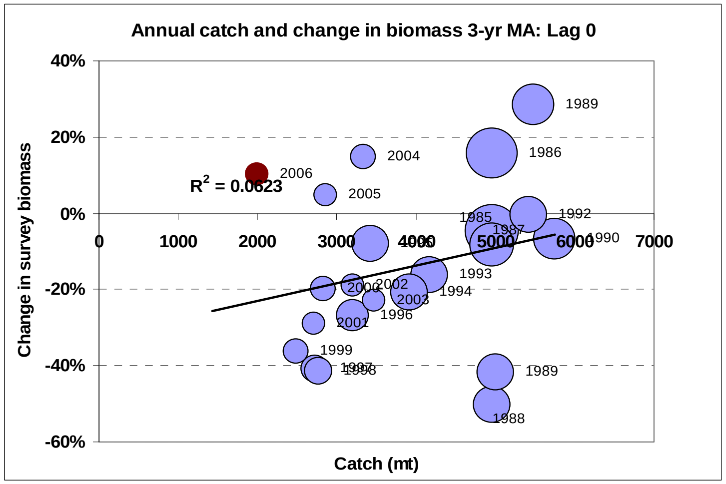
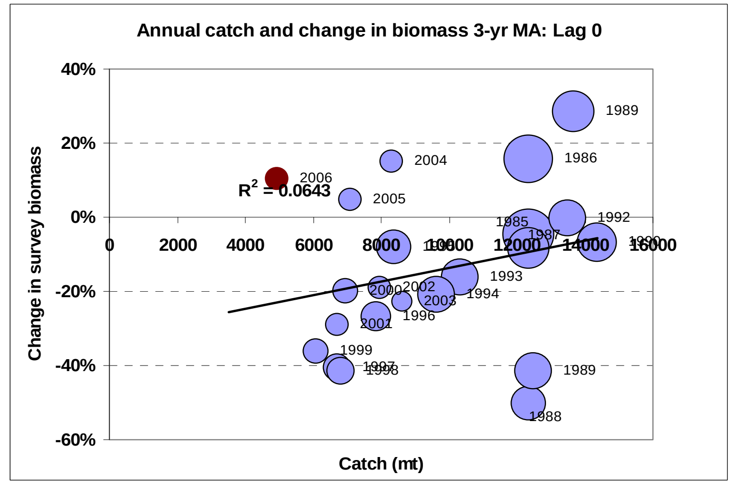


Figure 13. Annual change in fall survey biomass (3 year moving average) for thorny skate as a function of skate complex landings (3 year moving average) and discard mortality. Landings data are allocated by species based on proportions of exploitable size skates in the survey data. The size of the data points are proportional by area to the stratified mean weight. The dark (red) data point represents the 2004-2006 survey and lagged catch/landings (3 year moving average). A linear trend line and correlation coefficient are shown.

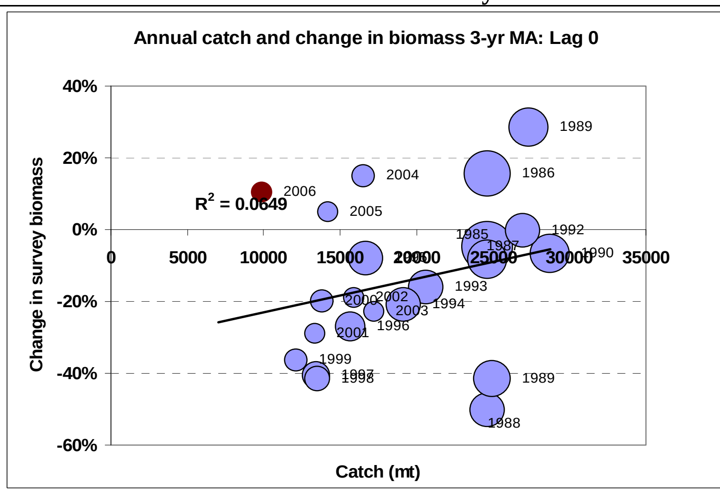
10% discard mortality



25% discard mortality



50% discard mortality



75% discard mortality

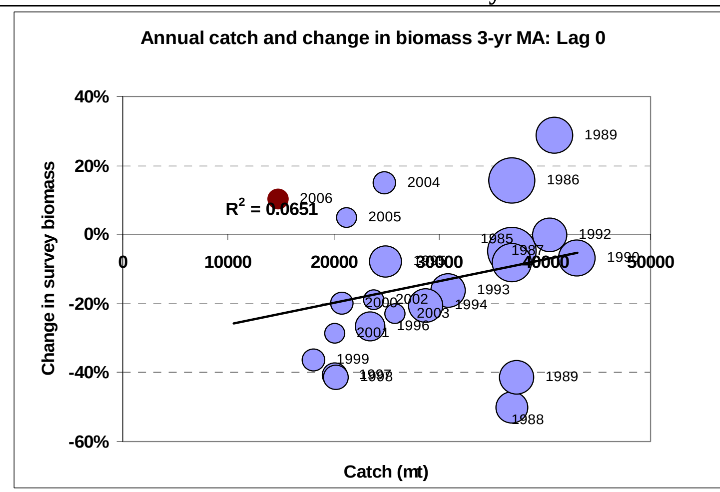
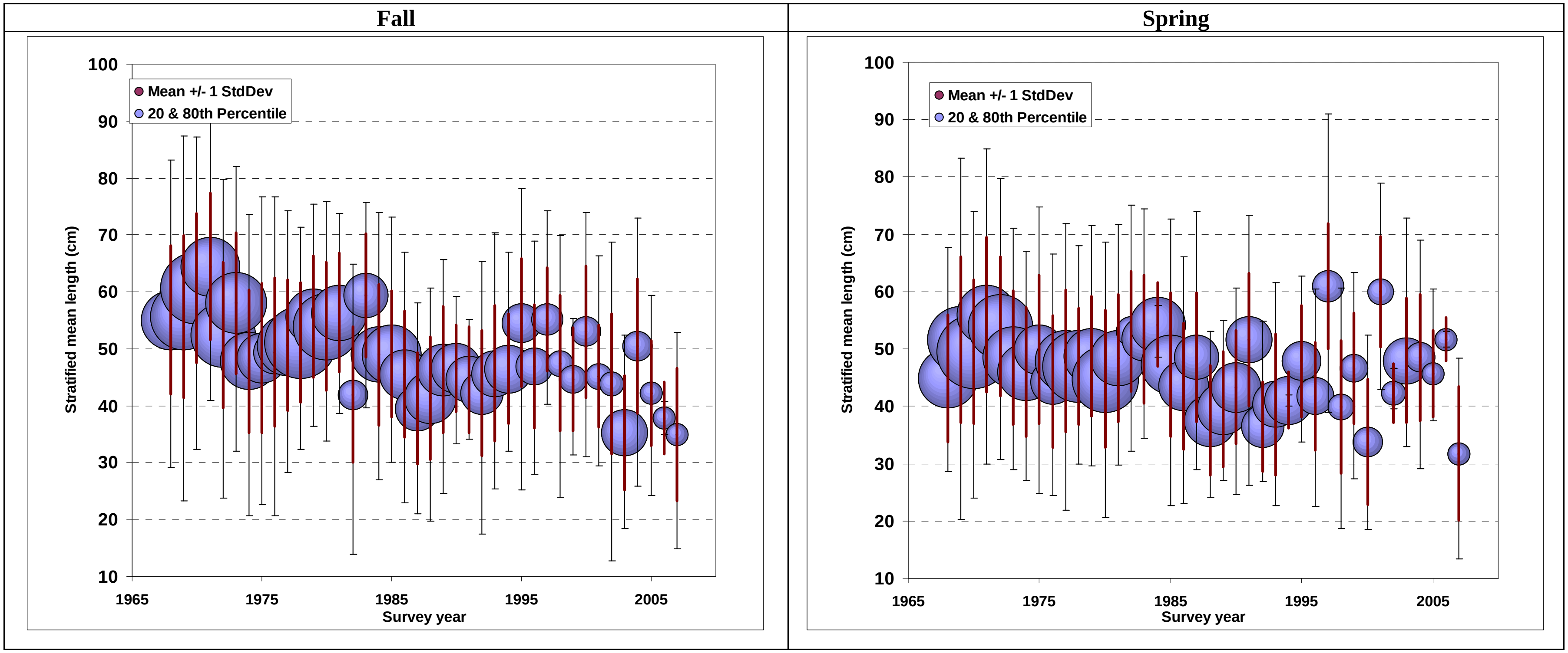


Figure 14. Trend in stratified mean length of thorny skate by survey, showing one standard deviation and the 20th and 80th percentiles. The size of the data point is scaled to stratified mean abundance.



Little skate summary

Little skate was also analyzed even thought it technically is not overfished. It was included because as of 2006, the last two survey biomass values were very near the biomass threshold and little skate could be classified as overfished with the addition of 2007 survey data, if biomass does not increase from the 2006 level.

Except for the 2006 fall survey, the trends in mean size and abundance do not show any alarming trends (Figure 21). Mean size seems to have held steady or possibly increase in recent years in all three surveys. Although mean size in the 2006 fall survey decreased by 5 cm, there was no apparent increase in abundance that would be consistent with a strong year class. Whether the 2006 data represent an anomaly remains to be seen.

Correlations between catch and changes in survey biomass appear to be very weak (Figures 15 and 16). There seems to be a better correlation between exploitation (C/B) and changes in biomass when landings and 25% discards are used to estimate total catch (Figure 19). This correlation may however be spurious because biomass is used in both sides of the equation.

The relationship between catch and biomass does not seem to improve when the landings are allocated to species based on proportions of exploitable skate biomass in the survey (Figure 18). About the only thing that can be noted is that it appears that biomass declined in 2005 and 2006 despite the landings and discards being amongst the lowest of the time series (Figure 18).

There appears to be a slight correlation between exploitation and biomass when discard mortality is at 10%, but the correlation becomes less apparent as a higher discard mortality is assumed (Figure 20). Including discards in the analysis of changes of little skate biomass probably introduces more noise than information because the species composition of the discards is not estimated.

Perhaps the PDT might consider recommending that little skate landings should be limited the mean or median for the time series. This would be a reduction from 2006 levels calculated from landings allocated by species.

Figure 15. Annual change in fall survey biomass for little skate as a function of skate complex landings or catch in the same year as the survey occurred. The size of the data points are proportional by area to the stratified mean weight. The dark (red) data point represents the 2006 survey and 2006 catch/landings. A linear trend line and correlation coefficient are shown.

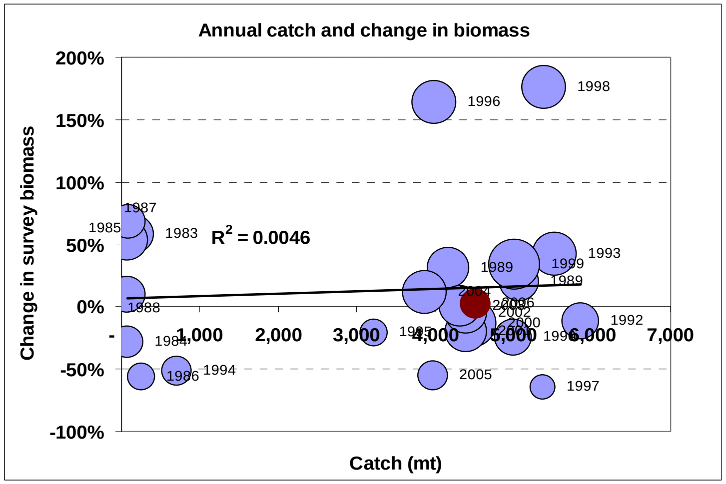
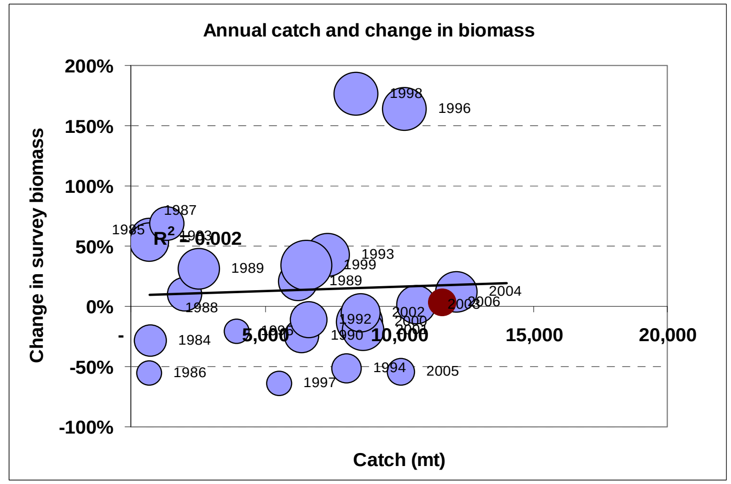
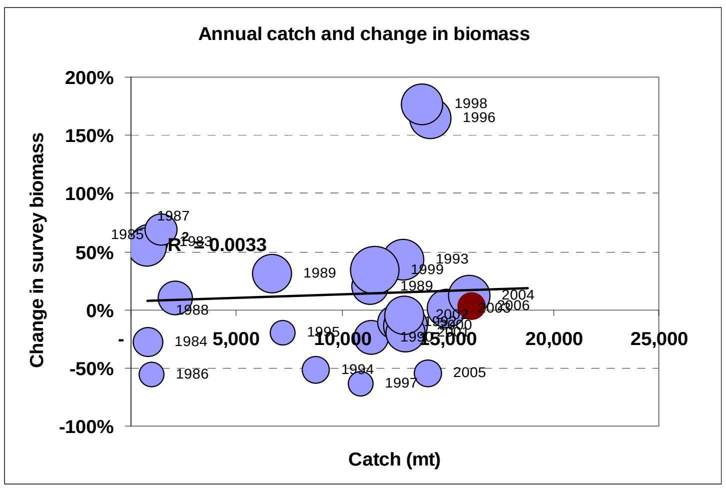
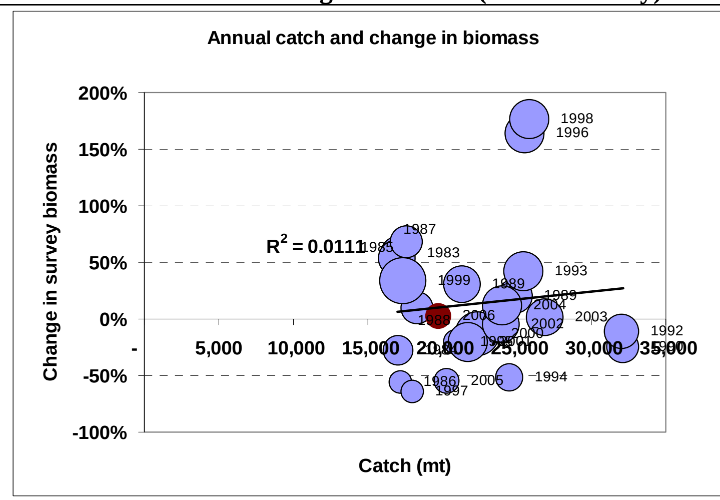
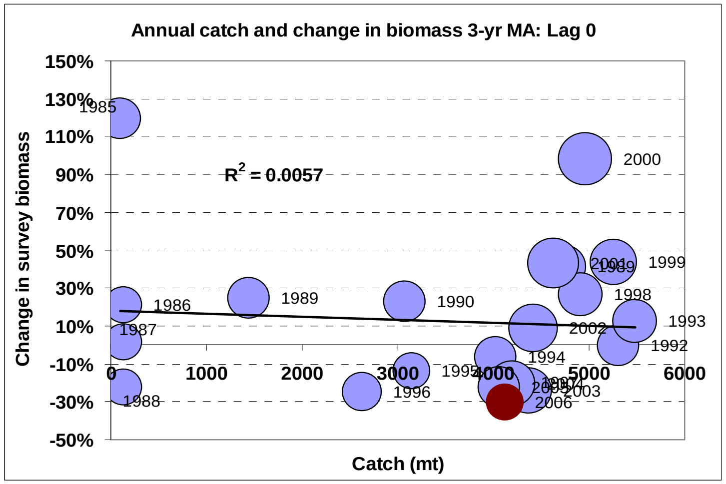
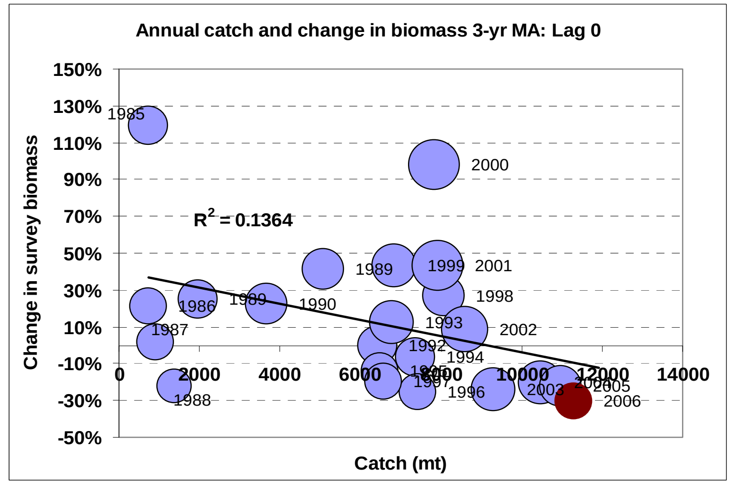
Catch = Whole landings only	Catch = Wing landings only
	
Catch = Total landings	**Catch = Total landings + Discards (25% mortality)**
	

Figure 16. Annual change in fall survey biomass (3 year moving average) for little skate as a function of skate complex landings (3 year moving average). The size of the data points are proportional by area to the stratified mean weight. The dark (red) data point represents the 2004-2006 survey and 2004-2006 catch/landings. A linear trend line and correlation coefficient are shown.

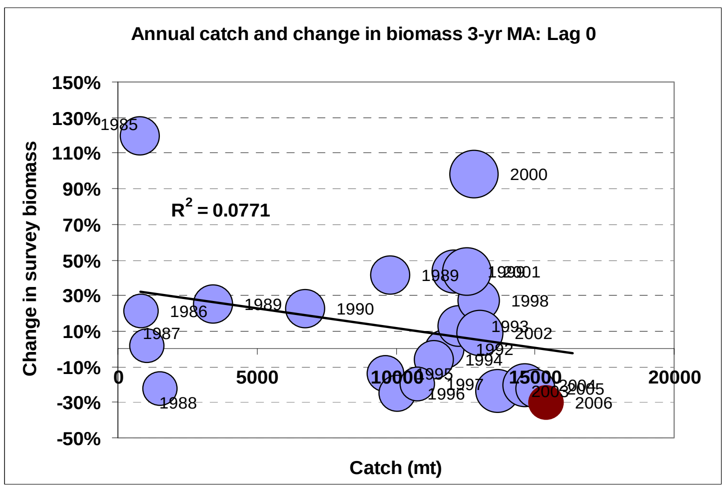
Catch = Whole landings only



Catch = Wing landings only



Catch = Total landings



Catch = Total landings + Discards (25% mortality)

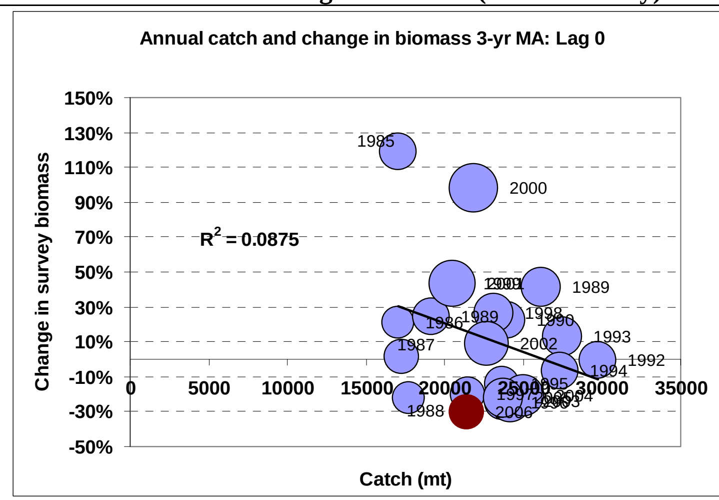
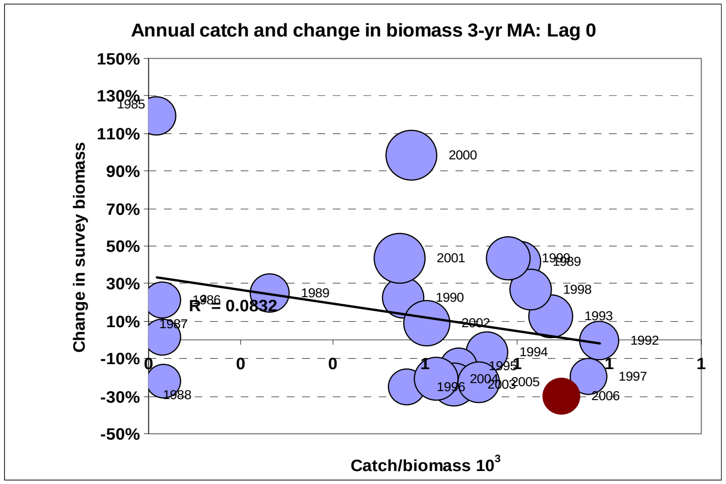
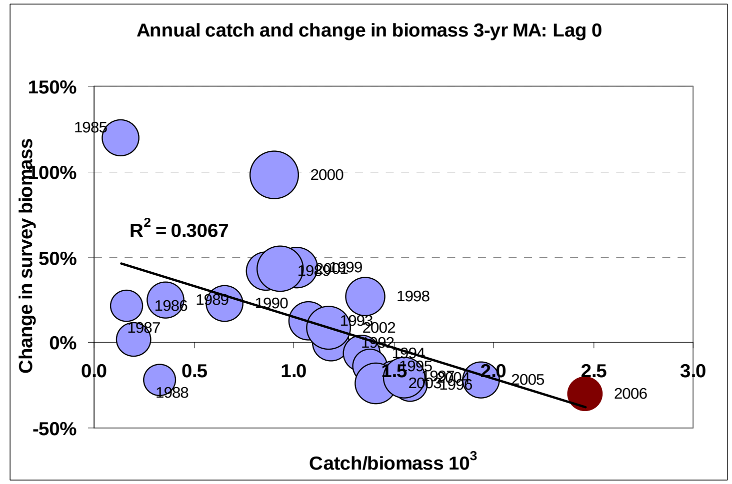


Figure 17. Annual change in fall survey biomass (3 year moving average) for little skate as a function of exploitation (3 year moving average catch/biomass). The size of the data points are proportional by area to the stratified mean weight. The dark (red) data point represents the 2004-2006 survey biomass and 2004-2006 exploitation index. A linear trend line and correlation coefficient are shown.

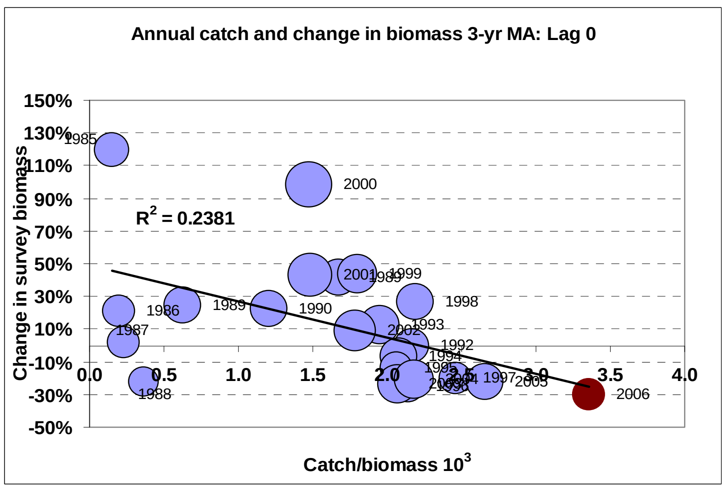
Catch = Whole landings only



Catch = Wing landings only



Catch = Total landings



Catch = Total landings + Discards (25% mortality)

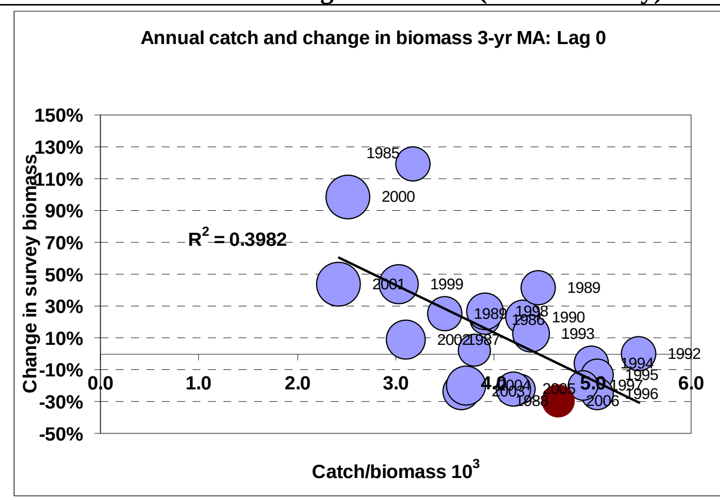


Figure 18. Annual change in fall survey biomass (3 year moving average) for little skate as a function of exploitation (3 year moving average catch/biomass). Landings data are allocated by species based on proportions of exploitable size skates in the survey data. The size of the data points are proportional by area to the stratified mean weight. The dark (red) data point represents the 2004-2006 survey biomass and 2004-2006 exploitation index. A linear trend line and correlation coefficient are shown.

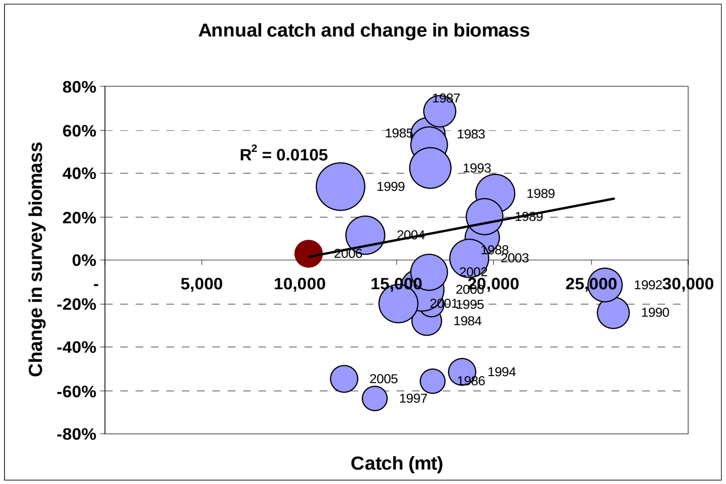
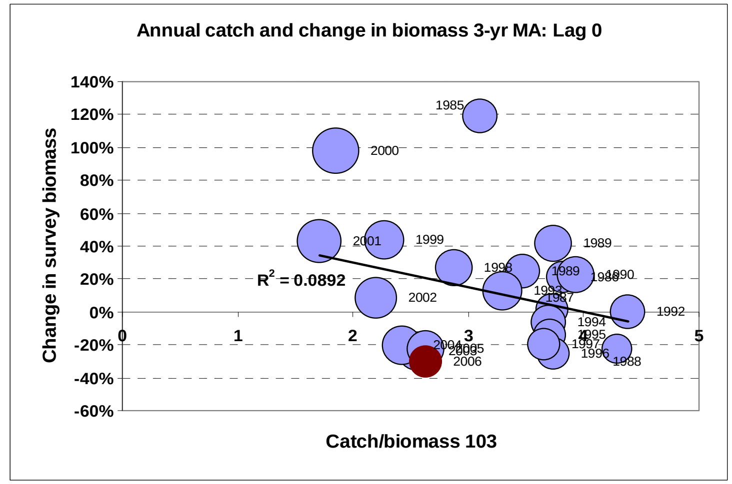
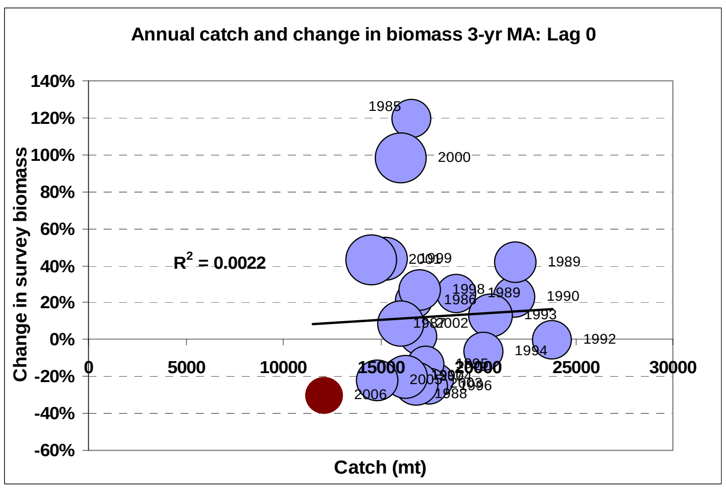
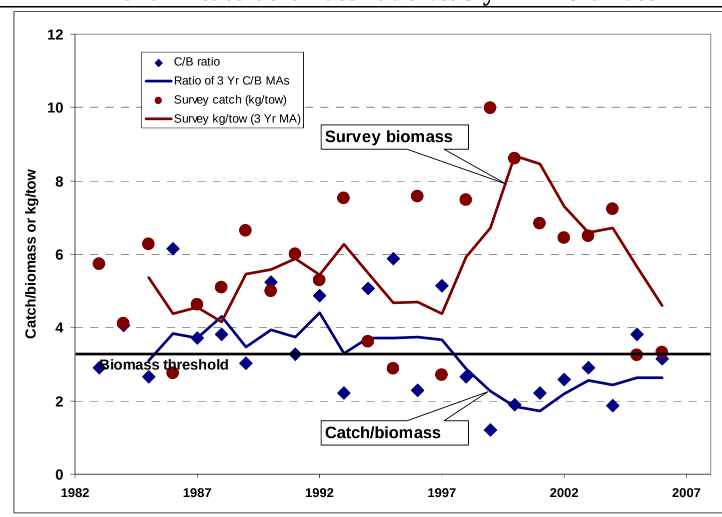
Annual catch vs. biomass, no lag	Catch/biomass ratio vs. 3 yr MA biomass
	
Annual catch vs. 3 yr MA biomass, no lag	**Trend in catch/biomass ratio vs. 3 yr MA biomass**
	

Figure 19. Annual change in fall survey biomass (3 year moving average) for little skate as a function of skate complex landings (3 year moving average). The size of the data points are proportional by area to the stratified mean weight. The dark (red) data point represents the 2004-2006 survey and lagged catch/landings (3 year moving average). A linear trend line and correlation coefficient are shown.

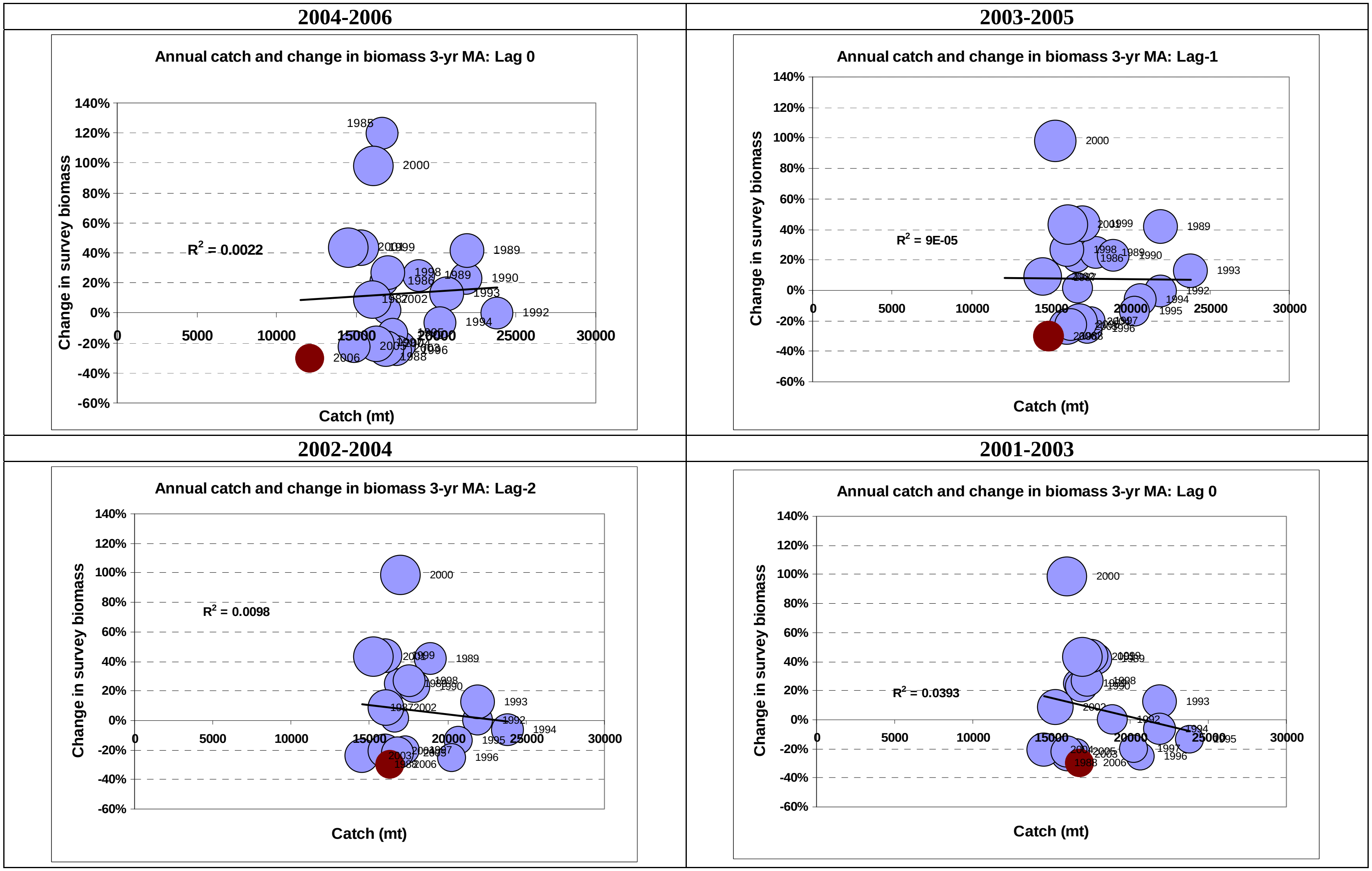


Figure 20. Annual change in fall survey biomass (3 year moving average) for little skate as a function of skate complex landings (3 year moving average) and discard mortality. Landings data are allocated by species based on proportions of exploitable size skates in the survey data. The size of the data

points are proportional by area to the stratified mean weight. The dark (red) data point represents the 2004-2006 survey and lagged catch/landings (3 year moving average). A linear trend line and correlation coefficient are shown.

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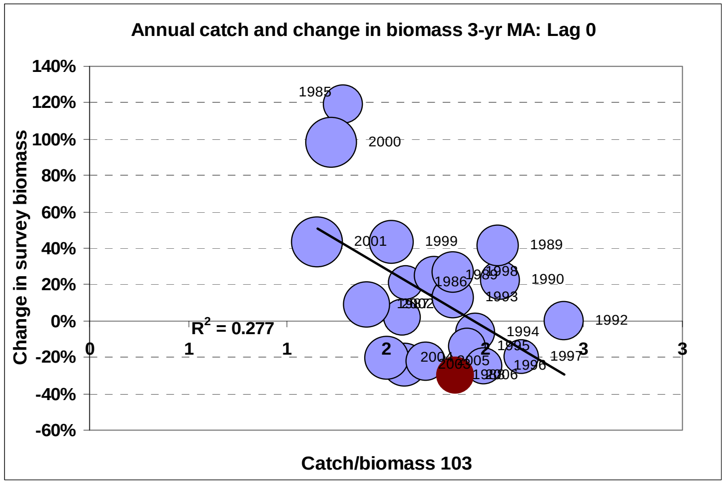
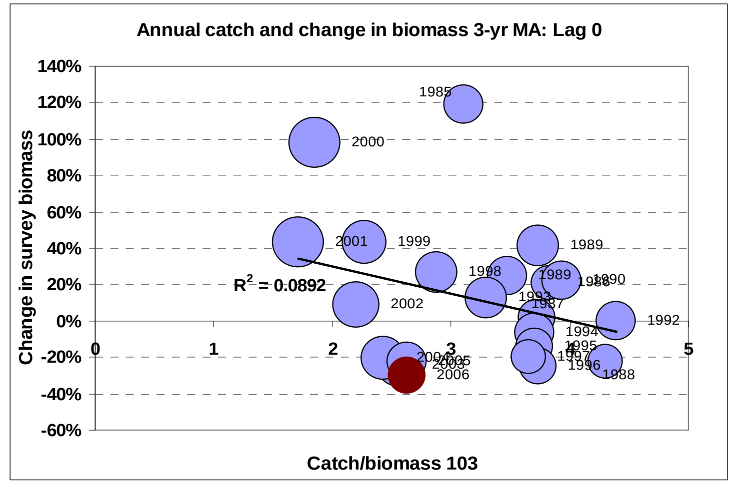
<tr><td>
</td><td>
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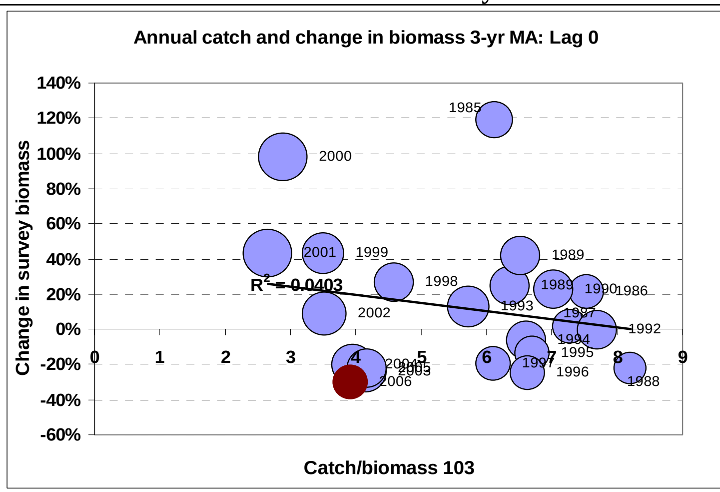
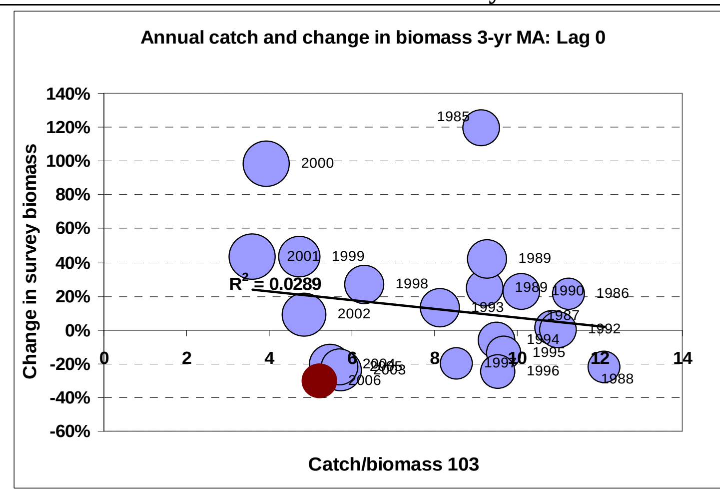
<tr><th>50% discard mortality</th><th>75% discard mortality</th></tr>
<tr><td>
</td><td>
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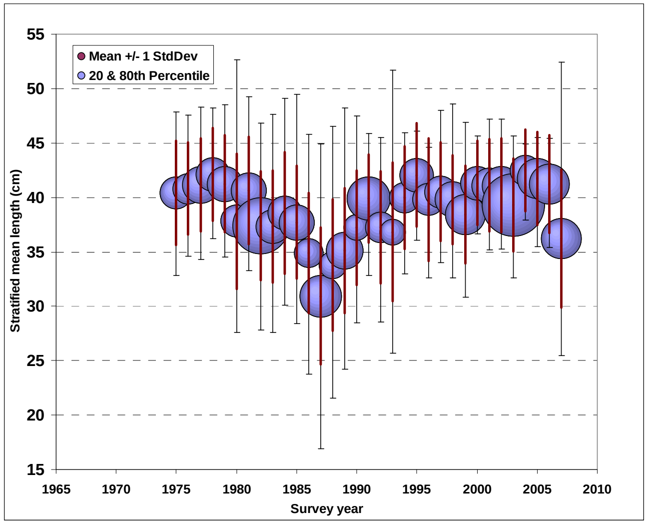
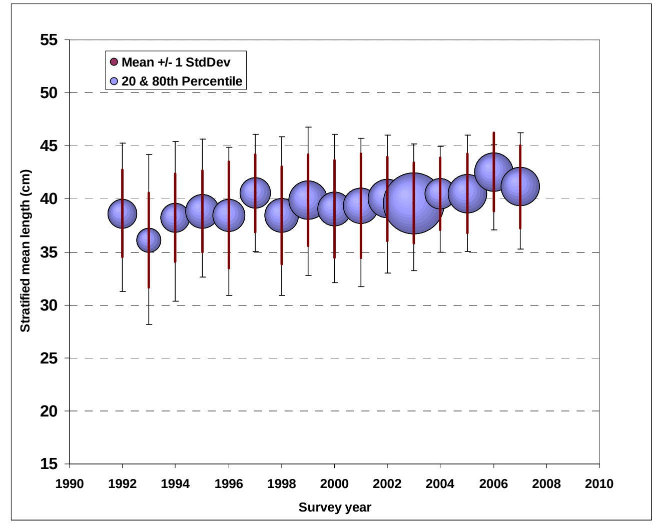
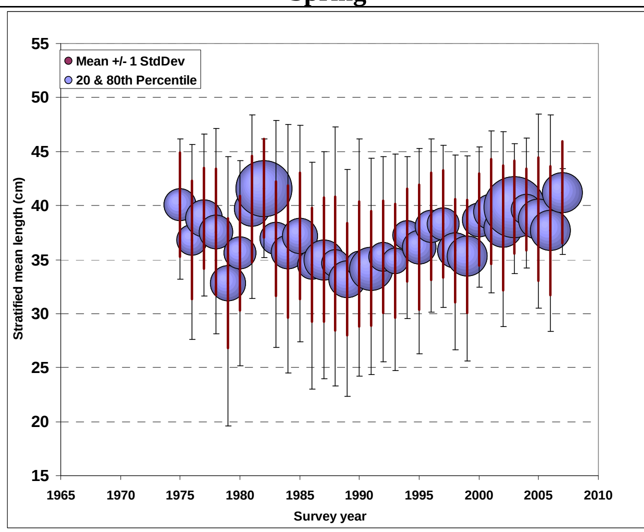
Figure 21. Trend in stratified mean length of little skate by survey, showing one standard deviation and the 20th and 80th percentiles. The size of the data point is scaled to stratified mean abundance.

Fall	Winter


Mean +/- 1 StdDev
20 & 80th Percentile
Stratified mean length (cm)
Survey year
55
50
45
40
35
30
25
20
15
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010


Mean +/- 1 StdDev
20 & 80th Percentile
Stratified mean length (cm)
Survey year
55
50
45
40
35
30
25
20
15
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010

Spring


Mean +/- 1 StdDev
20 & 80th Percentile
Stratified mean length (cm)
Survey year
55
50
45
40
35
30
25
20
15
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010

5. Document 5

Skate ABC and TAL recommendations

New England Fishery Management Council
50 WATER STREET | NEWBURYPORT, MASSACHUSETTS 01950 | PHONE 978 465 0492 | FAX 978 465 3116
John Pappalardo, *Chairman* | Paul J. Howard, *Executive Director*

MEMORANDUM

DATE: **March 27, 2008**

TO: Skate Oversight Committee and Council Science and Statistical Committee

FROM: Skate PDT

SUBJECT: **Skate ABC and TAL recommendations for Amendment 3**

The PDT offers the following advice related to setting skate ABCs and ACls to prevent overfishing and rebuild winter and thorny skates. These recommendations are based on the March 26, 2008 memo titled "Application of catch/biomass regressions to estimate catch limits to rebuild winter and thorny skates".

- The TAC limit should take into account uncertainty about discard mortality and its effect on trends in catch

- The TAC and TAL thresholds should take into account uncertainty about species composition of the landings and the appropriate split between landings and discards

- Setting limits using catch vs. catch/biomass ratio – Using a catch/biomass is more risk adverse because it automatically adjusts the limit when biomass declines, but may be capped at the TAC based on historic catch when biomass increases.

- Lack of relationship between catch and changes in biomass could occur due to catches being well below appropriate reference points or because there is insufficient contrast in catch and biomass during the time series, or simply there are inaccurate assumptions about species composition.

- However, lacking other information, the PDT believes that median catch levels are appropriate limits for species that are not overfished and a lower percentage of the time series is appropriate for setting catch limits for overfished species.

Using catch vs. catch/biomass

Catch/biomass is a better parameter for setting limits when stock biomass is low, but catch would be more appropriate as stock biomass increases.

Using discard mortality assumptions

A higher assumption of discard mortality results in a more liberal catch limit because it affects the amount of historic catch when discards were higher than they were in 2006. Therefore, a lower assumption of discard mortality results in more conservative estimates of TAC.

The only study of skate discard mortality occurred in 2006 in Canadian waters on winter skate for trawl gear. This study estimated discard mortality to be around 50%. The PDT realizes that discard mortality varies with conditions, species, and gear, so the PDT assumed a range of discard mortality equal to 25 to 50%.

Using various discard/landings splits (time period)

Because discards were historically higher than they were in 2006, using a longer time period to determine the split results in more liberal discard limits and more conservative landings limits when the longest time period (1989 to 2006) is applied.

Using splits between wing and whole skate landings to derive TALS (used 2004-2006)

Use of a more recent time series allocates a higher proportion of the TAL to the wing fishery because recent landings in this fishery have been increasing.

Consensus advice

The median catch or catch/biomass values should be used to establish a skate ABC and the 75/80% of median values should be used to set annual catch limits as risk-adverse targets. The PDT does not recommend setting ABCs for individual species due to significant problems with species identification in landings and discards. These problems appear to have a low probability of immediate resolution. Landing skates in whole form would resolve some of the species identification issues, but raises other industry concerns about safety, ice and processing costs, and disposal. Such a measure could however promote more full utilization of the resource.

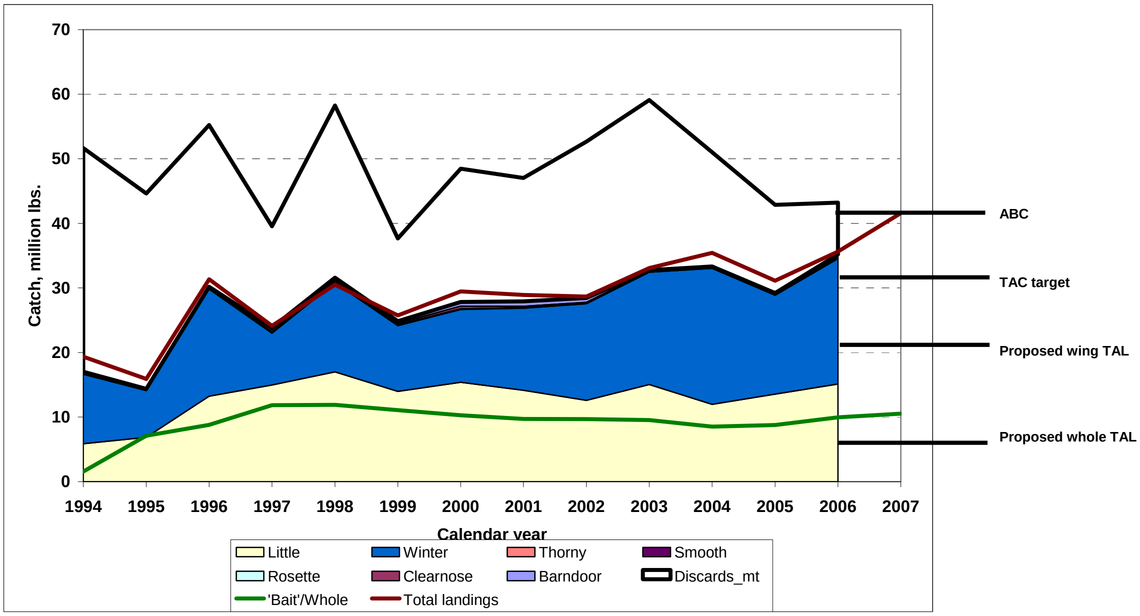
Because Table 7 reflects more recent trends in lower discards, the PDT recommends using this as the basis for setting skate TACs and TALs. Therefore, the Council should consider setting an aggregate skate TAC of 18,940 mt, a wing TAL of 6,701 mt, and a whole/bait TAL of 3,128 mt. The TALs are based on a target derived from 75% of the median catch/biomass ratio of the time series. As stock biomass increases, the limit and targets based on catch median would become the more conservative value and be used in lieu of those based on the catch/biomass ratio.

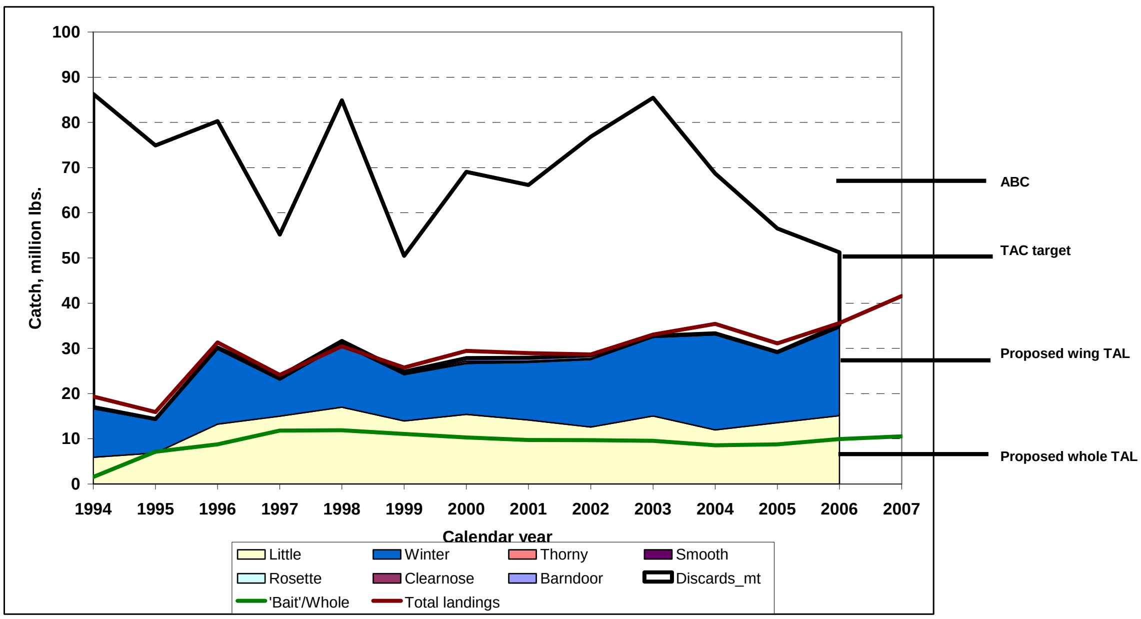
Table 1. PDT recommendations for ABCs and wing and whole TALs highlighted in boldfaced, outlined values.

25% discard mortality				
	Catch		Catch/biomass * 04-06 b	
Species	Median	80% of medi	Median	75% of me
Barndoor	192	154	2,399	1,799
Clearnose	264	211	308	231
Little	11,207	8,965	9,594	7,195
Rosette	15	12	26	19
Smooth	23	18	24	18
Thorny	94	75	46	34
Winter	10,879	8,703	7,905	5,929
Total	22,674	18,139	20,302	15,226
Discards	6,517	5,214	5,835	4,377
Prohibited species	278	223	2,222	1,667
Legal species	6,239	4,991	3,613	2,710
	0.28	0.28	0.20	0.20
Allowable landings	16,156	12,925	14,466	10,850
Prohibited species	31	25	247	185
Legal species	16,126	12,900	14,220	10,665
Wings	11,232	8,985	8,935	**6,701**
Change from 2007	-20%	-36%	-37%	-52%
Whole	4,925	3,940	4,170	**3,128**
Change from 2007	3%	-17%	-13%	-34%
TAL	16,156	12,925	13,105	9,829
Discards	6,517	5,214	5,835	4,377
TAC	22,674	18,139	**18,940**	14,205
Change from 2006	14%	-8%	-4%	-28%

50% discard mortality				
	Catch		Catch/biomass * 04-06 b	
Species	Median	80% of medi	Median	75% of me
Barndoor	290	232	3,127	2,345
Clearnose	521	417	568	426
Little	17,524	14,019	16,062	12,046
Rosette	26	21	50	37
Smooth	33	26	35	26
Thorny	155	124	66	49
Winter	17,422	13,938	11,951	8,963
Total	35,971	28,777	31,858	23,893
Discards	16,062	12,849	14,225	10,669
Prohibited species	430	344	2,905	2,179
Legal species	15,632	12,506	11,320	8,490
	0.44	0.44	0.40	0.40
Allowable landings	19,909	15,927	17,633	13,224
Prohibited species	48	38	323	242
Legal species	19,861	15,889	17,310	12,982
Wings	13,881	11,105	10,969	**8,227**
Change from 2007	-1%	-21%	-22%	-42%
Whole	6,028	4,823	5,374	**4,031**
Change from 2007	26%	1%	13%	-16%
TAL	19,909	15,927	16,343	12,258
Discards	16,062	12,849	14,225	10,669
TAC	35,971	28,777	**30,569**	22,927
Change from 2006	53%	23%	30%	-2%

Figure 22. Recommended targets and catch thresholds with 25% (upper) and 50% (lower) discard mortality assumptions.





6. Document 6

Using Demographic Models to Determine Intrinsic Rate of Increase and Sustainable Fishing for Elasmobranchs

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Using Demographic Models to Determine Intrinsic Rate of Increase and Sustainable Fishing for Elasmobranchs: Pitfalls, Advances, and Applications

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Abstract.—Leslie matrices and life tables are demographic models commonly used to evaluate the ability of specific elasmobranch life history strategies to sustain given levels and patterns of fishing pressure. These models are generally density independent and provide an instantaneous rate of population growth for a specified set of life history traits that correspond to a specific population size. Many investigators are using these models to compute rates of population growth that they claim are estimates of the maximum population growth rate ($r_{intrinsic}$); they then use these estimates to compute purported estimates of maximum sustainable fishing mortality. However, neither a Leslie matrix nor a life table can be used to estimate $r_{intrinsic}$ without additional information, except in the special case where a severely depleted population is modeled. Only in a severely depleted population will competition for resources be at a minimum and both density-dependent compensation and the rate of population growth be at a maximum (i.e., at $r_{intrinsic}$). The fundamental problem is to determine the life history parameters that would occur if the population were extremely depleted because extensive observations on extremely depleted populations are rare. In the absence of such data, $r_{intrinsic}$ can only be estimated from these types of density-independent models by extrapolating observed population growth rates toward zero population size. We illustrate the problems in, and describe methods for, estimating $r_{intrinsic}$ and present information on two species of elasmobranch: barndoor skate *Dipturus laevis* and lemon shark *Negaprion brevirostris*.

Classic demographic analysis, based on a life table or Leslie matrix, provides an estimate of the exponential (or, more properly, geometric) rate of population growth or decline based on a fixed set of life history parameters. Alternatively, the model can be thought of as providing the current (short-term) rate of population change under current conditions. For the elasmobranchs, where many stocks have been severely depleted, the question is to what extent these populations can withstand fishing pressure. Recently, this question has been approached by attempting to use demographic models to determine the intrinsic or maximum rate of population increase ($r_{intrinsic}$) and therefore the maximum sustainable fishing pressure. However, fundamental errors in the interpretation of the models are common.

Problems in the use of a basic demographic analysis for estimating $r_{intrinsic}$ arise from the density-independent nature of its structure and the use of static life history parameter inputs. In reality, at least some life history traits must be pliable and able to respond to changes in population size. This forms the basic logic behind density-dependent compensation, which explains why populations rarely go extinct and cannot grow beyond the bounds fixed by limiting factors (such as food resources or space) for extended periods (i.e., there is a carrying capacity of the environment).

Throughout most of this paper, we will assume for simplification of exposition that all compensatory response occurs in the survival in the first year of life (S_0) rather than in maturity, fecundity, or survival after the first year. This may be particularly justifiable in the case of viviparous elasmobranchs, as it is unlikely that litter size or mating frequency could change appreciably, and S_0 appears to be related to population size in at least one of the species on which we focus, the lemon shark *Negaprion brevirostris* (Gruber et al. 2001). When evidence exists that compensation occurs in other parameters, this is easily incorporated into the models. In our analysis of the lemon shark (see Application to Elasmobranchs below), for example, we had evidence to support extending the compensatory response into the survival of age-1 animals. For oviparous elasmobranchs with an egg stage duration

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approaching a year, the mechanism for compensation may be more complex, involving fecundity (eggs/year), egg survival (S_{egg}), and S_0. We deal with this added complexity in our analysis of the barndoor skate *Dipturus laevis* (see Advances in Methodology and Application to Elasmobranchs).

Direct evidence for density-dependent relationships is rarely available. In fact, even estimating the survival of the youngest animals is extremely difficult regardless of population size. Therefore, these models can be used in reverse, allowing first-year survival (S_0) to be calculated assuming a schedule of reproductive output and survival (excluding S_0) and a known rate of population growth (e.g., a 10% rate of increase might be observed when a stock is released from fishing pressure or zero growth might be observed or hypothesized when the population is at equilibrium; Vaughan and Saila 1976). Hoenig and Gruber (1990) expanded on this approach by estimating S_0 for a virgin population of lemon sharks assumed to be at equilibrium. They assumed that changes in S_0 are the principal mechanism for density-dependent compensation, and for a series of increasing values of fishing mortality, calculated the value of S_0 that would result in equilibrium. Since it is unlikely that first-year survival can rise to the level for unfished adults, the value of fishing mortality that would require the first-year survival to rise above that of an adult in an unfished population was interpreted as an upper limit to sustainable fishing mortality. Similarly, an upper limit to the intrinsic rate of population growth ($r_{intrinsic}$) is estimated by removing fishing pressure from this model. However, there is no guarantee that these upper limit estimates can be achieved.

A number of studies have followed this upper-limit approach (Sminkey and Musick 1996; Casey and Myers 1998; Mollet and Cailliet 2002). However, Cortés' (2004) summary of studies using demographic analysis for elasmobranchs reveals that many investigators either (1) purported to calculate an actual value for $r_{intrinsic}$ (or, equivalently, to calculate maximum sustainable fishing pressure) rather than an upper bound or (2) tried to rank species by the amount of fishing mortality they can withstand. The logic behind these attempts is generally unclear and is either flawed or based on unstated and unrealistic assumptions.

In this paper we first review the logic of simple demographic analysis using the Leslie matrix (the same logic holds for life tables), show basic relationships, and discuss what can and cannot be inferred. We then discuss how additional information can be utilized to make additional inferences. We derive methods for estimating $r_{intrinsic}$ and apply them to two elasmobranch species, barndoor skate and lemon shark.

Basics of Population Dynamics and Demographic Analysis

Demographic analysis simply tracks the change over time in the number of animals at different ages or stages given a schedule of age- or stage-specific reproductive output and mortality (Gotelli 1998; Caswell 2001). Models can be constructed assuming continuous or annual reproduction and, in the latter case, assuming that abundances pertain to the period just before or just after breeding occurs.

Suppose we have the following information, which would be required for an age-based demographic analysis of a viviparous species: age at maturity (a_{mat}) = 3 years, longevity (a_{max}) = 6 years, survivorship at each age ($S_0, S_1, S_2, \ldots, S_5$), and the production of females per female ($f_1, f_2, f_3, \ldots, f_6$), which is a function of the percentage reproducing in each age-class, the frequency of births, the sex ratio, and litter size. We assume that the numbers are tallied before reproduction takes place (a prebreeding census). We can then calculate from the number of females at each age ($n_{1,j}, n_{2,j}, \ldots, n_{6,j}$) the number there will be in the following year ($n_{1,j+1}, n_{2,j+1}, \ldots, n_{6,j+1}$), where n_{ij} is the number of animals of age i at the start of year j. The number of age-0 females produced will be

$$n_{1,j+1} = S_0 \sum_{i=1}^{6} n_{i,j} f_i. \quad (1)$$

The number of females at all other ages is given by

$$n_{i+1,j+1} = n_{i,j} S_i. \quad (2)$$

Often, the age-specific fecundities can be modeled, at least approximately, as the product of the age-specific proportion of mature adults (P_i) and a constant fecundity per mature adult (f), such that $f_i = P_i f$. This assumes that the fecundity of mature animals does not change with age.

These basic relationships are fundamental to any demographic analysis, including life tables, matrix analysis, and Euler–Lotka approaches. In a Leslie matrix analysis, the life history information for our example is organized in a projection matrix **A** as follows:

$$\mathbf{A} = \begin{bmatrix} 0 & 0 & S_0 f_3 & S_0 f_4 & S_0 f_5 & S_0 f_6 \\ S_1 & 0 & 0 & 0 & 0 & 0 \\ 0 & S_2 & 0 & 0 & 0 & 0 \\ 0 & 0 & S_3 & 0 & 0 & 0 \\ 0 & 0 & 0 & S_4 & 0 & 0 \\ 0 & 0 & 0 & 0 & S_5 & 0 \end{bmatrix}.$$

For an oviparous species with an egg stage lasting approximately 1 year, the matrix would have an

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additional row and column to accommodate the egg stage. The first row of the matrix would have entries representing the product of fecundity (female eggs/year) and egg survival. The second row would have S_0 in the first column and zeros elsewhere, and each subsequent row would have a single survival rate corresponding to the next age-class.

The number of females at each age at time t is denoted by

$$\mathbf{N}_t = [n_{1,t}, n_{2,t}, n_{3,t}, n_{4,t}, n_{5,t}, n_{6,t}]^{\mathrm{T}}.$$

The female population at time $t + 1$ is then given by

$$\mathbf{N}_{t+1} = \mathbf{A}\mathbf{N}_t. \tag{3}$$

The predicted rate of population increase ($r_{predicted}$) is defined here to be the instantaneous rate of growth of the population given the parameters used in the projection matrix and a stable age distribution. It is directly related to the largest eigenvalue (λ) of the matrix $\mathbf{A}$ as $r_{predicted} = \log_e(\lambda)$ (Vaughan and Saila 1976). In a follow-up study, Vaughan (1977) derived a computational method to calculate $r_{predicted}$ that is often used in practice.

In this type of demographic model, $r_{predicted}$ represents a snapshot of the population growth rate based on a fixed set of life history parameters and a given schedule of fishing mortality. In reality, populations are not governed by a fixed set of life history parameters but by the dynamic relationship of these parameters to stock size. The basic logistic model of population growth has been used extensively in both fisheries and ecological research and is the simplest to include density-dependent compensation through a linear relationship of the per capita population growth rate to population size. Throughout this paper, the logistic model will simply serve to illustrate the importance of including stock size in the design and interpretation of a demographic model. In reality, the relationship may be curvilinear (see, for example, Sibley et al. 2005), but use of a nonlinear model requires more data, which will often not be available.

The logistic model (and density-dependent models in general) states that under virgin conditions a population will reach an equilibrium state around a carrying capacity (K; Figure 1a). The number of births will equal the number of deaths and the population growth rate will equal zero until some force, such as fishing pressure, reduces the population size. At lower numbers, more resources are available to each individual and survival, particularly that of first-year individuals, increases. If the population is released from the fishing pressure, a recovery begins at a rate that is conditional on the population size relative to the virgin stock size. The logistic model states that the instantaneous per capita rate of growth will be greatest in an uncrowded condition. As the population recovers and resources become increasingly limiting, population growth slows and eventually approaches zero (i.e., births equal deaths). In reality, virgin populations may not have a zero growth rate at any particular point in time. However, we stress that the expected or long-term average growth rate must be zero.

We use the following definitions of instantaneous population growth rates in this paper:

- $r_{intrinsic}$ = the maximum per capita population growth rate (this can only occur in the absence of fishing at the lowest population size, when density-dependent compensation is at a maximum); a stable age distribution is assumed;
- $r_{conditional}$ = the per capita rate of population growth when there is no fishing mortality, given a schedule of survival and reproduction (conditional on population size and the resulting density-dependent compensation) and given a stable age distribution. In a logistic model, $r_{conditional} = r_{intrinsic} \cdot (1 - N/K)$, where N is the total population size and K is the carrying capacity;
- $r_{predicted}$ = the predicted rate of population growth per capita when all other parameters are known (assuming a stable age distribution and a given population size); $r_{predicted}$ equals $r_{conditional}$ minus any effects of fishing mortality, and
- $r_{achieved}$ = the per capita rate of population growth; no assumption of a stable age distribution is made.

It is important to note that the rate of population growth achieved in the field ($r_{achieved}$) is expected to equal $r_{predicted}$ when a stable age distribution is present in the population (Figure 2).

The principle that population growth rate is linked to population abundance is critical to the design and interpretation of any elasmobranch demographic analysis (Vaughan 1977; Hoenig and Gruber 1990). Consider a hypothetical elasmobranch population under three different levels of exploitation: virgin, moderately fished, and depleted (Figure 1b). Assume that the fishing history has been stable for long enough that by time a any density-dependent compensation that could occur has occurred and the populations are at equilibrium. The three populations will have realized different levels of density-dependent compensation to remain at equilibrium at different population sizes and

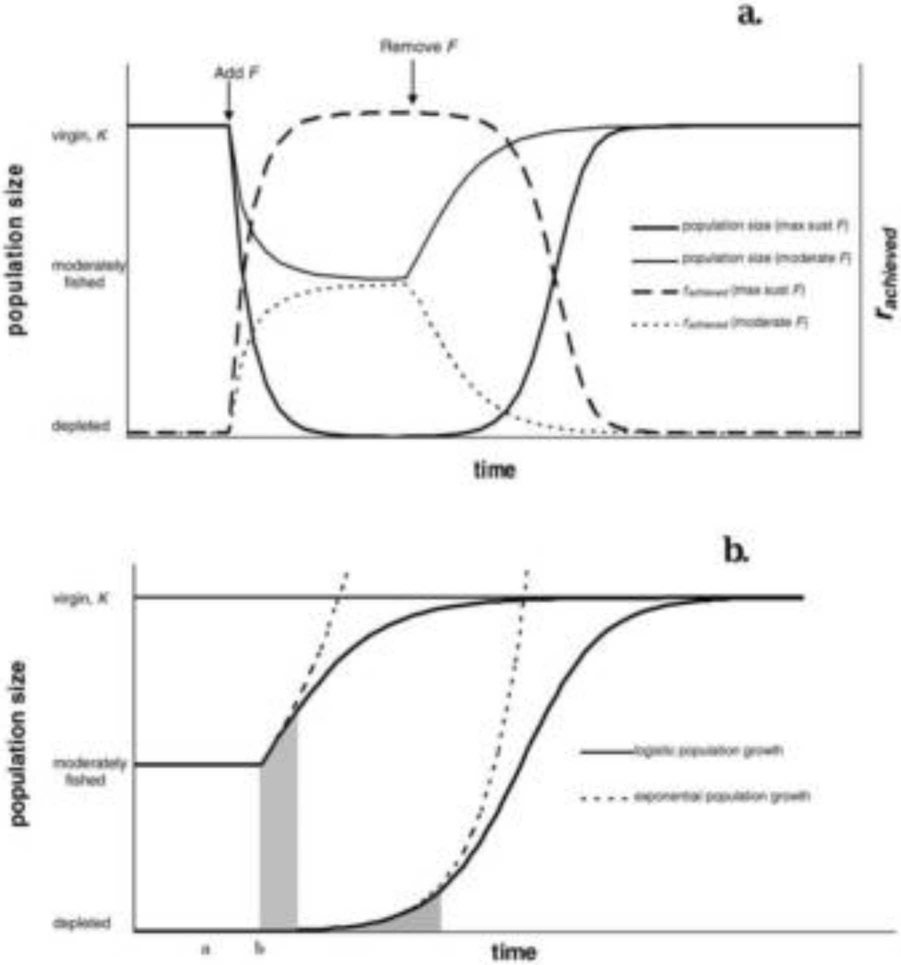

FIGURE 1.—Panel **(a)** shows the population dynamics and density-dependent responses in the per capita rate of population growth ($r_{achieved}$) to the addition and removal of two levels of constant fishing mortality (F) according to the logistic model of population growth (max sust F = maximum sustainable fishing mortality). Panel **(b)** shows the steady state (time a) and logistic growth of populations recovering from three levels of exploitation (to the right of time b) and their relationships to model predictions of exponential growth. The shaded regions indicate where the logistic and exponential models give similar results.

levels of fishing mortality (F). Note that this implies that the predicted rate of population change is zero in all cases. Removing the fishing mortality (time b) in each scenario reveals the potential rate of population increase ($r_{achieved}$) that can result at the given population size. (This rate of change will be close to $r_{conditional}$ but will not be exactly equal to $r_{conditional}$ because the age structure will no longer be in equilibrium). The virgin population can realize no change in fishing mortality and continues at its carrying capacity in an equilibrium state ($r_{achieved} = r_{conditional} = r_{predicted} = 0$). The moderately fished population has been released from some level of fishing mortality, and the calculated value of $r_{achieved}$ represents the short-term growth potential of a population of that size when released from exploitation. In the depleted population, density-dependent compensation is at its maximum (S_0 is at its maximum in our example), and once released from fishing pressure the population will recover at close to its maximal rate ($r_{achieved}$ approaches $r_{intrinsic}$ and would equal $r_{intrinsic}$ if an equilibrium stable age structure were present). Thus, the instantaneous potential population growth rate ($r_{achieved}$) depends on the size of the population. This is a property of all population models with density dependence. According to the logistic model being used in our example and assuming a stable age distribution, the population growth rate is related to the intrinsic rate of increase in the absence of fishing by

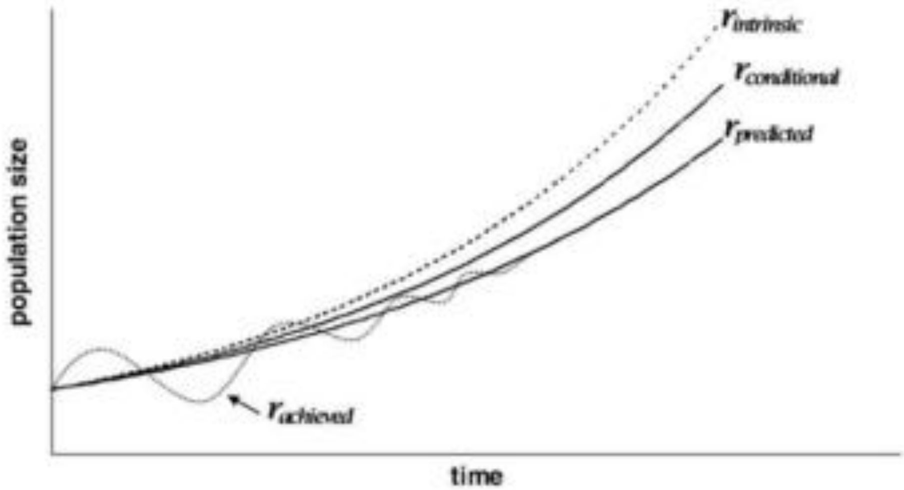

FIGURE 2.—Exponential population growth under fishing pressure ($r_{predicted}$), under no fishing pressure ($r_{conditional}$), and at the maximum rate ($r_{intrinsic}$), all with a stable age distribution, and under fishing pressure without a stable age distribution ($r_{achieved}$).

the linear relationship (Figure 3)

$$r_{\text{conditional}} = r_{\text{intrinsic}} \cdot (1 - N/K). \tag{4}$$

Note that $r_{conditional}$ is the per capita instantaneous rate of population growth; the instantaneous rate of population increase is

$$\frac{dN}{dt} = r_{\text{conditional}} \cdot N = r_{\text{intrinsic}} \cdot (1 - N/K) \cdot N, \tag{5}$$

and the short-term population trajectory is

$$N_{t+\Delta t} = N_t \cdot e^{r_{\text{intrinsic}} (1 - N_t/K) \times \Delta t}. \tag{6}$$

When fishing occurs on all ages at an instantaneous rate F (per year),

$$r_{\text{predicted}} = r_{\text{conditional}} - F = r_{\text{intrinsic}} \cdot (1 - N/K) - F. \tag{7}$$

Using the calculated $r_{conditional}$ in each population to project the population growth forward in time after the cessation of fishing along with equation (6) (and

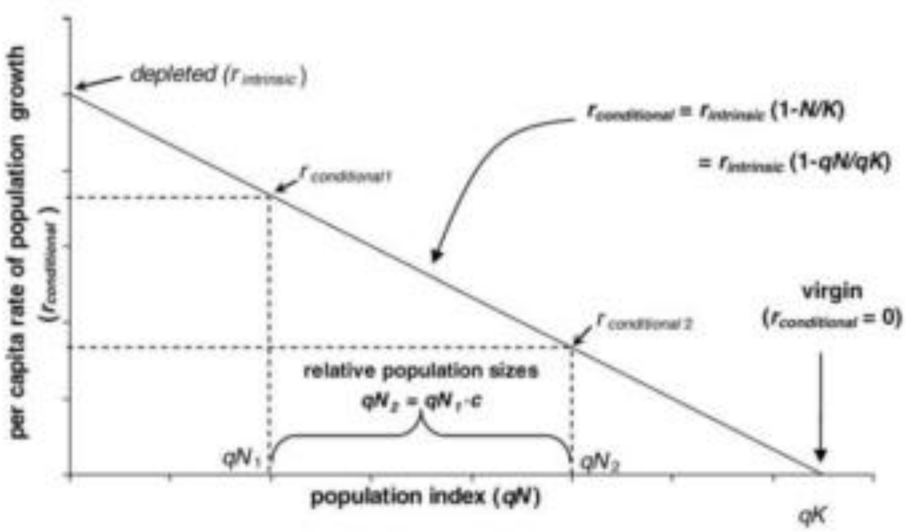

FIGURE 3.—The instantaneous per capita rate of population growth ($r_{conditional}$) for a stock as a function of stock size under logistic growth when fishing mortality is zero. When fishing mortality occurs equally at all ages, $r_{predicted} = r_{conditional} - F = r_{intrinsic} \cdot (1 - N/K) - F$, where N/K is the ratio of the population size to the virgin population size. The relationships used to derive equations (8)–(10) for $r_{intrinsic}$ based on survey indices are indicated; q is a constant relating the index to actual population size.

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assuming a stable age distribution) further illustrates the density-independent nature of the Leslie matrix–life table model (Figure 1b). Exponential growth is predicted. This is realistic over the short term but becomes increasingly unrealistic as the stock grows larger. The value of $r_{conditional}$ is dependent on the life history parameters (S_0 in our example), which, in turn, are dependent on stock size. The value of $r_{conditional}$ and the predicted exponential growth approximate the results from the more realistic logistic growth model only for a specific stock size and thus only for a short period of time. It is therefore only possible to compute $r_{intrinsic}$ from a demographic analysis if the model parameters represent conditions in a severely depleted population or if additional information is available. In all other cases, all that is known about the calculated rate of population increase ($r_{conditional}$) is that it falls somewhere between 0 and $r_{intrinsic}$ (Figure 3).

Uses of the Leslie Matrix

The above is not meant to imply that a Leslie matrix has no value by itself. A demographic analysis can be used to check the validity of parameter estimates. For example, Grusha (2005) found that parameter values from the literature for a viviparous species, the cownose ray *Rhinoptera bonasus*, in Chesapeake Bay seemed reasonable but led to a life table prediction that the population would crash under no fishing pressure unless S_0 exceeded 100%. In this case or that in which S_0 is required to be greater than adult survival, the life history parameters are suspect and need to be reevaluated. The situation is more complicated for an oviparous species, and we discuss this in Advances in Methodology.

Unfortunately, for most elasmobranchs, the information necessary to determine $r_{intrinsic}$ through classic demographic modeling is unavailable. Even in the most well-studied species, where age at maturity, fecundity, natural mortality, and even stock size are known, estimates of S_0, F, and the rate of population change ($r_{achieved}$) are rare. These three parameters are closely linked. In situations where two of the three parameters are known, the Leslie model can be used to solve for the remaining one (assuming that all other model parameters are known). For example, in situations where F can be assumed to be zero and $r_{achieved}$ is known, the model can be solved for S_0 (as in Vaughan and Saila 1976; Hoenig and Gruber 1990). Alternatively, if F is assumed to be zero and S_0 is known, the model can be solved for the current rate of population change (in this case $r_{predicted}$ should equal $r_{conditional}$; we return to this case when we consider the lemon shark data in Applications to Elasmobranchs). If F and S_0 are not known, as in most cases, there are an infinite number of solutions to the model that will result in equilibrium (or a specified rate of population growth).

In situations where even less information is available, matrix models can be used to examine the effects of individual parameters while holding all the other parameters constant and accounting for initial conditions (age composition). This can provide insights into the dynamics of the population, such as how various age-specific harvesting strategies affect the dynamics (Cortés 1995; Heppell et al. 1999; Beerkircher et al. 2002), but it does not allow quantitative predictions if some parameters are unknown and fixed at arbitrary values.

Pitfalls of Interpreting Demographic Analyses

For many viviparous elasmobranchs, parameter estimates are available for the proportion mature at age, fecundity, longevity, and survival in the absence of fishing mortality for all but the youngest age-class(es). In only a few cases are estimates of observed population growth available. For oviparous species, estimates of fecundity are harder to obtain and information on egg stage and first-year survival is scant.

Lacking direct information, many studies have used empirical relationships to obtain survival rates. These relationships are of two types: those that provide a single value (e.g., Pauly 1980; Hoenig 1983; Jensen 1996) and those that provide age-specific values (Peterson and Wroblewski 1984; Chen and Watanabe 1989) (Table 1). The assumptions behind the use of the two types of estimates are different and should result in different interpretations of model results.

Most studies use empirical relationships that provide a single survival rate that presumably pertains to most of the lifespan in the absence of fishing. When this value is used in a demographic analysis, it is assumed that first-year survival in a severely depleted population equals that of unfished adults and represents the maximum possible value, $S_{0,max}$. The calculated rate of population increase is then often interpreted as $r_{intrinsic}$ on the assumption that all other parameters are known. Although this can be a useful upper-limit biological reference point, there is no guarantee that a stock can exhibit this degree of compensation and growth and thus no evidence that this represents $r_{intrinsic}$. The maximum achievable S_0 is likely to be species specific, lower than the survival rate for an adult, and a function of size at birth. Assuming that S_0 can reach adult levels will clearly tend to overestimate $r_{intrinsic}$, but to what degree is unknown. Thus, the rate of increase calculated by setting S_0 equal to the survival of unfished adults gives us an upper-bound proxy for

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TABLE 1.—Survival rates for barndoor skate as derived from methods commonly used in demographic analysis, with required parameters in parentheses. Estimates were made an age at maturity (a_{mat}) of 6.5 years (Gedamke et al. 2004), von Bertalanffy growth parameters (k, L_∞, and t_0) of 0.14/year, 166.3 cm, and −1.29 year, respectively), an assumed maximum age (a_{max}) of 25 years, and a water temperature of 8.5°C (Myers et al. 1997). The methods used are as follows: Hoenig (1983), Pauly (1980), Jensen (1996), Chen and Watanabe (1989), and Petersen and Wroblewski (1984).

Age	Hoenig (a_{max})	Pauly (L_∞, k, water temperature)	Jensen (a_{mat})	Jensen (k)	Chen and Watanabe (age, k, t_0)	Peterson and Wroblewski (weight at age)
0	0.846	0.843	0.776	0.811	0.429	0.517
1	0.846	0.843	0.776	0.811	0.600	0.649
2	0.846	0.843	0.776	0.811	0.684	0.714
3	0.846	0.843	0.776	0.811	0.733	0.752
4	0.846	0.843	0.776	0.811	0.765	0.777
5	0.846	0.843	0.776	0.811	0.787	0.795
6	0.846	0.843	0.776	0.811	0.803	0.808
7	0.846	0.843	0.776	0.811	0.844	0.818
8	0.846	0.843	0.776	0.811	0.844	0.826
9	0.846	0.843	0.776	0.811	0.844	0.832
10	0.846	0.843	0.776	0.811	0.844	0.837
11	0.846	0.843	0.776	0.811	0.844	0.841
12	0.846	0.843	0.776	0.811	0.844	0.844
13	0.846	0.843	0.776	0.811	0.844	0.847
14	0.846	0.843	0.776	0.811	0.844	0.850
15	0.846	0.843	0.776	0.811	0.844	0.852

$r_{intrinsic}$, that is, a quantity related to $r_{intrinsic}$ that may have some use for fisheries management.

In some studies, purported estimates of $r_{intrinsic}$ have been calculated by specifying age-specific survival rates, including first-year survival, utilizing the empirical relationships described by Chen and Watanabe (1989) or Peterson and Wroblewski (1984) (e.g., Simpfendorfer 2000; Beerkircher et al. 2002; Cortés 2002). However, these empirical relationships were not based on modeling severely depleted populations but rather describe "normal" or virginal survival. Therefore, analysis of a Leslie matrix based on these parameter values should result in a value of $r_{conditional}$ of zero (i.e., the value corresponding to the average growth of a virgin population). Any departure from zero represents measurement error, not the intrinsic rate of population increase. The expectation in much of the literature is that estimates of population growth calculated from a demographic analysis with no fishing mortality will be positive and that the amount of fishing mortality that results in an equilibrium state ($r_{predicted} = 0$) represents the maximum sustainable fishing pressure that can occur before a species is at risk of extinction. This is false.

If we consider the hypothetical populations presented in Figure 1b, the error in this logic is clear. In the depleted population at time a, $r_{conditional}$ is equal to $r_{intrinsic}$, while in the virgin population $r_{conditional}$ is equal to zero. In our depleted scenario, the F that results in equilibrium is the maximum sustainable fishing pressure. In contrast, the removal of a single fish per year (i.e., any $F > 0$) in our virgin population will result in negative population growth under the Leslie (exponential) model, which does not allow for compensation. According to the widespread logic, this means that a virgin population is more susceptible to fishing pressure than a depleted population of the same species. This conclusion is obviously false and highlights the strong relationship between the results of a simple demographic model and the population size for which model parameters have been specified.

Ranking Species

A number of studies have suggested that demographic analyses can be used for comparative purposes, that is, to rank species according to their ability to withstand exploitation based on calculated values of the rate of population increase (Smith et al. 1998; Walker and Hislop 1998; Frisk et al. 2002; Gallucci et al. 2006). Therefore, it is worth examining whether a Leslie matrix or life table can be used to rank species if we cannot get unbiased estimates of the intrinsic rate of increase. We consider four proxies for $r_{intrinsic}$ found in the literature that differ in the way S_0 is computed. All methods are based on the assumption that all other parameters are known; S_0 is derived by

(1) setting it equal to a constant for all species (Frisk et al. 2002),
(2) setting it equal to the survival of unexploited adults,
(3) setting it equal to virgin survival as computed from the formulae of Chen and Watanabe (1989) or Peterson and Wroblewski (1984), or
(4) solving for it after setting adult survival equal to the square of the unexploited survival rate, that is, exp(−2M) (Smith et al. 1998).

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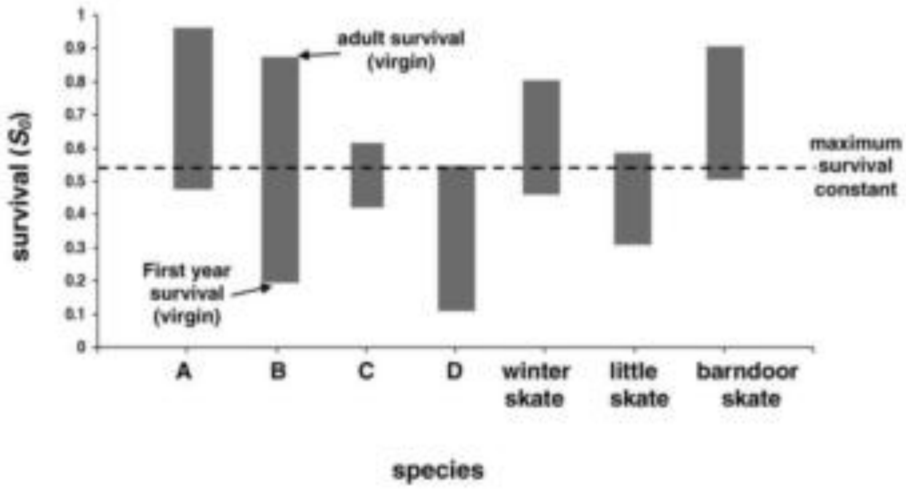

FIGURE 4.—Model for compensation in which all species attain the same maximum value of S_0 (indicated by the dashed line) regardless of first-year survival in a virgin population (below the dashed line) and adult survival in the absence of fishing (above the dashed line). Species A–D represent hypothetical populations. For the little skate, winter skate, and barndoor skate, adult survival is as in Frisk et al. (2002) and first-year survival was calculated according to the method of Peterson and Wroblewski (1984). Note the differing levels of compensation that are assumed when a constant S_0 is used.

Species vary in their size at birth and thus presumably in their first-year survival. However, under the first approach it is assumed that all of the populations being considered have the same maximum first-year survival (Figure 4). That is, although we know that the species vary in life history traits, this approach assumes they do not vary at all in the parameter that is likely to play the greatest role in determining a species' scope for compensation and therefore its intrinsic rate of increase. According to this model, differences among species in their intrinsic rate of increase are due to differences in fertility and adult survival only. We would argue that it is just as plausible (or more plausible) that the first-year survival of all species lies half way between virgin S_0 and virgin adult survival. In fact, the constant-S_0 approach has important implied assumptions regarding the scope of density-dependent compensation that are illustrated in Figure 4. Population A, the winter skate *Leucoraja ocellata*, and the barndoor skate are assumed to have almost no scope for compensation, while first-year survival in population D and the little skate *L. erinacea* can fully compensate in the sense of coming close to adult values. Species B resembles species D in having very low survival in virgin populations, but the first-year survival of D can rise to that of adults whereas the first-year survival of B can only reach half that of adult survival. It is not clear that this is a reasonable assumption. Therefore, this ranking of species' resiliency is conditional on the model of compensation being correct, which has not been demonstrated.

Many studies compute an upper-bound proxy for $r_{intrinsic}$ by setting first-year survival equal to virgin adult survival. This has the advantage of inducing a positive bias, so that upper bounds to the intrinsic rate of increase (and thus sustainable fishing mortality) can be obtained. That is, with this procedure we can conclude that certain levels of fishing mortality are not sustainable. However, this proxy may or may not be appropriate for ranking species' growth potential. Consider two shark species, the sand tiger *Carcharias taurus* and the tiger shark *Galeocerdo cuvier*. Both species have large maximum sizes and high longevities, but the former has two large pups while the latter has dozens of small pups. The sand tiger pups probably have high survival under virgin conditions, and it is not unreasonable to suppose that their survival could rise the small distance to adult survival. The tiger shark pups are much smaller and presumably have much lower survival under virgin conditions. It is less likely that their survival will approach the survival of adults. In other words, the potential scope of compensation may be markedly different even for these two apparently similar species. Thus, investigators can disagree over whether the use of this proxy for ranking species' population growth potential is reasonable.

Next, consider the estimates that result when first-year survival is set equal to the Chen and Watanabe (1989) or the Peterson and Wroblewski (1984) estimates. All the estimates of population growth rate should be close to zero, so that all we are getting from

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this procedure is measurement error, which clearly is not a basis for ranking species.

Finally, consider the procedure of Smith et al. (1998). These investigators recognized the problems that result from the density-independent nature of demographic models and began the process of developing a methodology and a biological benchmark that would be comparable across species. The main assumption in their model is that a population being fished to produce maximum sustainable yield (MSY) will be at half the virgin stock size and have adult mortality of $Z = F + M = 2M$. They further assume that any density-dependent compensation occurs in S_{juv} (the survival of juveniles) rather than in $S_{0'}$. They then follow the methodology of Vaughan (1977) and solve the model for the value of S_{juv} that results in equilibrium under the MSY fishing conditions. Finally, they remove the fishing mortality from the model and solve for the resulting instantaneous rate of population growth, which they term the "rebound potential" or r_{2M}. In this way they attempt to standardize the level of density-dependent compensation in different species by deriving an estimate of S_{juv} that is directly related to the life history parameters of the species. The validity of r_{2M} as a proxy for $r_{intrinsic}$ has not been established, but this approach has the potential to be used in comparative demography among species.

Although the Smith et al. (1998) approach has avoided some of the main pitfalls of demographic analysis by accounting for density-dependent compensation through clear logical assumptions, their procedure provides no indication of how far these rebound potentials are from $r_{intrinsic}$. Thus, managers are still faced with uncertainty about the maximum sustainable fishing pressure. To determine this, an actual estimate of $r_{intrinsic}$ is required.

Advances in Methodology

The absence of detailed information about a depleted population necessitates the use of alternative methods to estimate $r_{intrinsic}$. There are two aspects to the problem: (1) determining values of $r_{conditional}$ that correspond to a specific stock size and (2) determining $r_{intrinsic}$ from two or more values of $r_{conditional}$. The tools required to obtain an actual estimate of $r_{intrinsic}$ have long been in use in both fisheries and ecological research. Ricker (1975) summarized the early use of the logistic model for fishery assessment (and estimating $r_{intrinsic}$) when only limited data are available. Although he dealt with biomass models, the mathematics are the same if one substitutes numbers for biomass. We build our results on those presented by Ricker.

Estimating $r_{conditional}$ for a Viviparous Species

For viviparous species, we assume that the schedule of age-specific natural mortality for all ages above the first and age-specific fecundity are known for a particular population. Thus, everything is known except three parameters: first-year survival, fishing mortality, and the rate of population change, $r_{predicted}$ (or, more likely, $r_{achieved}$). As previously described, these three parameters are closely linked, and if two of the three are known the Leslie model or a life table can be used to solve for the third. For example, suppose the instantaneous natural mortality rate is estimated to be 0.2/year and the instantaneous fishing mortality rate is determined from a tagging study to be 0.3/year. Then all survivals except S_0 can be computed as $\exp(-0.2 - 0.3) = 0.6$. Suppose we know that the population is currently declining by 5% per year ($r_{achieved} = \log_e(0.95) = -0.051$/year) and we assume that $r_{achieved}$ is a reasonable estimate of $r_{predicted}$. Then the model can be solved for S_0 using Vaughan's (1977) method. We can analyze a Leslie matrix with the same fecundities and S_0 but with the other survivals adjusted to eliminate the fishing; in this case, survival for all ages except the first is $\exp(-0.2) = 0.8$. This provides an estimate of $r_{conditional}$. When fishing mortality applies to all ages, there is a simpler solution:

$$r_{predicted} = r_{conditional} - F. \tag{8}$$

In our example, fishing mortality applies to all ages except the first (i.e., the young of the year) and thus equation (8) is a reasonable approximation. Hence, $r_{conditional}$ for our example is $-0.051 + 0.30 = 0.249$/year.

Estimating $r_{conditional}$ for an Oviparous Species

In oviparous species with an egg stage lasting 1 year, the additional life stage adds a level of complexity to the demographic model. For these species an additional row and an additional column must be added to the matrix and another parameter, egg stage survival (S_{egg}), must be included in the model. In most cases there is considerable uncertainty in the estimates of both S_{egg} and fecundity. However, assuming that the proportion mature at age is known, all that is needed is the product of fecundity, S_{egg}, and S_0 rather than the value of each individual parameter. That is, doubling one parameter (e.g., S_0) and halving another (fecundity or S_{egg}) results in the same rate of population growth. This has an important implication for the reasonableness of parameter values. An S_0 estimate of, say, 200%, does not imply a poor fit of the model to the data. Rather, it implies that the apportionment of recruitment (fecundity$\cdot S_0 \cdot S_{egg}$) to individual parameters is in error, and this is inconsequential for projecting short-term changes in the population. On the other hand, if one constrains the values of S_{egg} and S_0 to be no more than 1, one can determine the minimum value for fecundity required for the population to grow at the observed rate.

The overall analysis for an oviparous species is virtually identical to that for a viviparous species, but instead of solving the model for S_0 as in the Vaughan (1977) method one solves it for the product of S_{egg}, S_0, and fecundity. Fishing pressure is then removed from the model as in the example for viviparous species to generate an estimate of $r_{conditional}$. We illustrate this approach in our barndoor skate example (see Application to Elasmobranchs).

Estimating $r_{intrinsic}$

The second step is to use the estimates of $r_{conditional}$ to estimate $r_{intrinsic}$. Here we make use of the linear relationship between $r_{conditional}$ and population size under the logistic model (equation 4) and utilize observations on population behavior at two or more stock sizes. There are two cases to consider. First, suppose that an estimate of the conditional rate of population growth ($r_{conditional}$) is available, along with an estimate of the corresponding population size (N) as a fraction of the virgin population size (K). Then, by virtue of the fact that the conditional rate is a linear function of population size (Figure 3; equation 4) and the value of $r_{conditional}$ is zero when $N = K$, we can solve for the intercept as

$$r_{intrinsic} = \frac{r_{conditional}}{1 - \frac{N}{K}} = \frac{K r_{conditional}}{K - N}. \qquad (9)$$

This methodology differs from all the current approaches to demographic analysis of elasmobranchs in that the results do not simply provide a snapshot of population growth under a given set of circumstances but rather define the overall relationship between population size and the per capita rate of population growth according to the theory of logistic growth.

In the second case, we have information from observation of the population at two or more stock sizes but do not know how those stock sizes relate to the virgin population level. Instead, we know the relative size of the population at the various times. Assume we have survey data that give relative population size (qN, where q is the catchability coefficient [a constant relating the index to the population size N]) at two points in time along with the corresponding information necessary to calculate $r_{conditional}$ (Figure 3). Since we are assuming that the relationship between $r_{conditional}$ and N is linear and now know the ratio of the qNs, we can derive the following equations:

$$r_{conditional_1} = \frac{r_{intrinsic}(qK - qN_1)}{qK} \qquad (10)$$

and

$$r_{conditional_2} = \frac{r_{intrinsic}(qK - cqN_1)}{qK}, \qquad (11)$$

where c is a constant known from the two surveys ($N_2 = cN_1$). Although these two equations have three unknowns (K, $r_{intrinsic}$, and N_1), a unique solution for $r_{intrinsic}$ results, namely,

$$r_{intrinsic} = \frac{(r_{conditional_2} - c r_{conditional_1})}{1 - c}. \qquad (12)$$

Therefore, to obtain an estimate of $r_{intrinsic}$ we can calculate $r_{conditional}$ at two points in time for which the relative population sizes are known.

Note that if enough values of $r_{conditional}$ with the corresponding (relative) population sizes are known, one can derive an empirical relationship between the population growth rate and size and extrapolate back to zero population size. This avoids having to make the assumption of a linear relationship. Alternatively, if an extensive time series of indices of abundance is available along with the corresponding (schedules of) fishing mortality, it may be possible to fit a model that incorporates density dependence directly. This may be more efficient than the two-stage procedure described here. Although such data will rarely be available, exploration of these ideas is exciting (but beyond the scope of this paper).

Application to Elasmobranchs

To illustrate the points made in this paper, we consider two species of elasmobranch: the lemon shark and the barndoor skate. For both species sufficient data are available to illustrate the methods presented and generate at least preliminary estimates of $r_{intrinsic}$. Our intent here is to demonstrate the methodology; a more detailed analysis is being conducted for both species.

Lemon Shark

The lemon shark is one of only a few elasmobranch species for which empirical estimates of S_0 are available. Estimates of S_0 were obtained for differing stock sizes between 1995 and 1999 through a tagging and depletion study in Bimini, Bahamas (Gruber et al. 2001; S. H. Gruber, unpublished). The results from this study suggest that density dependence is occurring in the lemon shark nursery area, with an apparently inverse relationship between first-year survival and the

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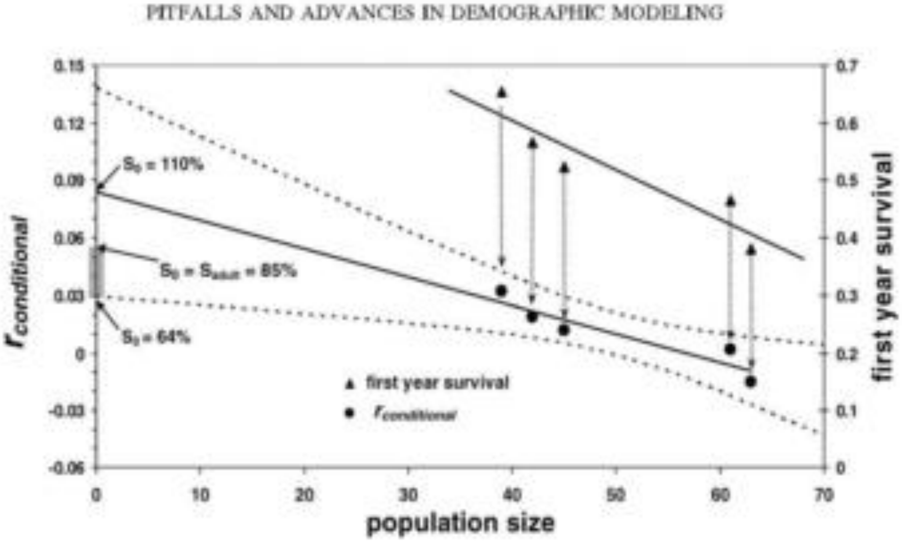

FIGURE 5.—The upper solid line shows the relationship between the first-year survival (S_0) of lemon sharks and the population size of juveniles at Bimini as determined from a tagging depletion study. Note that one additional data point has been calculated beyond those presented by Gruber et al. (2001). The lower solid line shows the relationship between $r_{conditional}$ and the corresponding population size (the first-year survival used to calculate each value of $r_{conditional}$ is also indicated). The y-intercept represents the estimated value of $r_{intrinsic}$, and the dotted lines represent the 95% confidence intervals for the regression. Also shown on the y-axis are the first-year survival rates corresponding to three values of $r_{conditional}$. The shaded area shows the range of possible values for $r_{intrinsic}$ that is consistent with the data and with the maximum value of S_0 not exceeding adult survival.

size of the age-0 population (Figure 5). Since there is no directed fishery for lemon shark juveniles at Bimini, we assume that for juveniles F is equal to zero. A prebreeding, birth-pulse, female-only Leslie matrix model was constructed with an age at maturity of 12 years and a longevity of 25 years. Lemon sharks are believed to have biennial parturition with an average of 12 pups, resulting in a fecundity term for the matrix of 3 females per year (Feldheim et al. 2002). Since lemon sharks have been shown to stay in the nursery lagoon at Bimini for the first few years of life (Morrissey and Gruber 1993), second-year survival was set at the mean of first-year and adult survival.

The model was then solved for the population growth ($r_{conditional}$) that would occur given each estimate of first-year survival (note that this implies setting survival after the second year equal to that which would occur in the absence of fishing; in this case we used $S = 0.85$ based on the Hoenig (1983) maximum-age formulation). The relationship between each year's estimated population size and $r_{conditional}$ allows us to extrapolate to a population growth rate as the population size approaches zero (i.e., $r_{intrinsic}$) of 0.08/year (Figure 5). As a check on the feasibility of this estimate, the model was solved for the S_0 that would be required for the population to grow at a rate of 0.08/year assuming $F = 0$. Given the life history parameters used in our model, S_0 would have to be 110% for the population to grow at our estimated value of $r_{intrinsic}$. Clearly, this is infeasible and not surprising given an extrapolation from five data points. However, if we use the lower confidence limit from our relationship between $r_{conditional}$ and population size, the estimate of $r_{intrinsic}$ is 0.03/year, which would require a first-year survival of 64% (Figure 5). Assuming that S_0 cannot be greater than adult survival (85%), we now have an upper bound for $r_{intrinsic}$ of 0.06/year and therefore an overall potential range of $r_{intrinsic}$ for the lemon shark of 0.03–0.06/year.

Barndoor Skate

The barndoor skate was reported to be potentially on the brink of extinction in 1998 (Casey and Myers 1998). As international fishing fleets were heavily fishing the Northwest Atlantic, National Marine Fisheries Service (NMFS) survey indices for the barndoor skate in the Gulf of Maine and southern New England went from highs of nearly 0.8 fish/tow in the early 1960s to lows of nearly zero for the 1970s and 1980s. In 1994, three large areas on Georges Bank (off Massachusetts) were closed to all mobile fishing gear. Since then, survey indices for the barndoor skate have been increasing at an annual rate of approximately 43%, providing an observed rate of growth of $\log_e(1.43) = 0.36$/year, which we assume is a reasonable estimate of $r_{achieved}$. An estimate of $F =$ 0.05/year was generated by using a modification of the nonequilibrium form of the Beverton–Holt mean length

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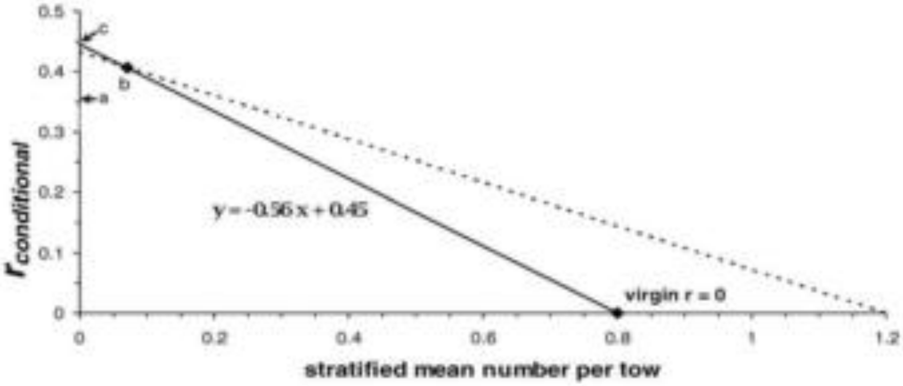

FIGURE 6.—Relationship between population growth rate and the NMFS survey index of population size for the barndoor skate (solid line). Point a indicates the value of r_{achieved} based on the change in the survey index over time, point b indicates the calculated value of $r_{\text{conditional}}$ at an abundance of 0.07 fish/tow, and point c indicates the estimated value of $r_{\text{intrinsic}}$. The dashed line indicates the slight reduction in $r_{\text{intrinsic}}$ that would occur if the virgin population size (0.8 fish/tow) is an underestimate.

mortality estimator (Gedamke and Hoenig 2006), which incorporates recruitment variability (Gedamke 2006) to estimate a total instantaneous mortality rate (Z) of 0.23/year. Subtracting the Pauly (1980) estimate for instantaneous natural mortality (M) of 0.18/year results in an estimate for F of 0.05/year. We assume that this fishing mortality pertains to all ages because barndoor skates are born at a large size of nearly 20 cm total length. Given an F of 0.05/year, we solved the Leslie matrix model for the product of fecundity, S_{egg}, and S_0 that would be necessary for the population to be growing at the observed rate of 0.36/year. Assuming that S_0 and S_{egg} are no more than 1, a minimum value for fecundity of 23 female eggs per year would be required for the population to grow at the observed rate. This is consistent with the fecundity estimates for similar oviparous species (Musick and Ellis 2005). Fishing pressure was then removed from the model to generate an estimate of $r_{\text{conditional}}$ of 0.41/year (equation 8).

Although the barndoor skate population is clearly depleted and our estimated $r_{\text{conditional}}$ should approximate $r_{\text{intrinsic}}$, we can take our analysis one step further by considering the relative stock sizes from the NMFS survey data. In 1994 the index was at approximately 10% of the high recorded at the start of the time series in 1963. If we treat the 0.8-fish/tow maximum observed in 1963 as representing the virgin condition (i.e., $r_{\text{conditional}} = 0$) and plot it together with our estimate of $r_{\text{conditional}}$ at the corresponding survey index (0.07 fish/tow), we get two points that uniquely define a straight line. Extrapolating to a stock size of zero gives an estimate of $r_{\text{intrinsic}}$ of 0.45/year (Figure 6). If the index in 1963 represents the situation with some fishing, then the rightmost point in Figure 6 should be farther to the right, thus lowering the y-intercept. Because the barndoor skate population was so low in 1994, the uncertainty in the virgin stock size affects the estimated value of $r_{\text{intrinsic}}$ only slightly.

The increase in the barndoor skate population size observed in the NMFS surveys provides compelling evidence that the skate population can grow rapidly, in excess of 40% per year. The corrections for fishing mortality and population size may be less compelling at this point but clearly demonstrate that such calculations are feasible.

Discussion

The use of a Leslie matrix or life table demographic analysis for an elasmobranch population is generally challenging because of limited information on population trends, fishing mortality, and life history parameters. The simplest case is the one in which the intrinsic rate of increase can be estimated from observations on a severely depleted population released from fishing pressure. This was approximately the case for the barndoor skate. But, in general, estimation of the intrinsic rate of increase is an involved process that requires some information on relative stock size. Most reported estimates of the intrinsic rate of population increase for elasmobranchs are ill founded because the analysis does not take population size into consideration.

Studies can take one of three approaches when direct observation of maximum population growth is not possible. The first is to determine the life history parameters, rate of population change, and fishing mortality that occur in an extremely depleted population. In this case, the model can be used to estimate the rate of population growth that would occur if the

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population were released from fishing pressure. For most species, however, not enough information is available and one of two alternative approaches must be taken. A basic demographic analysis only provides an instantaneous rate of population growth (not $r_{intrinsic}$, except in special circumstances) for a specific set of life history parameters associated with a specific fishing mortality and population size. As we show in this paper, with additional data it is possible to estimate $r_{intrinsic}$ from the results of basic demographic analyses by extrapolating the conditional population growth rate ($r_{conditional}$) to zero population size. When the data are insufficient for estimating $r_{intrinsic}$, however, the only recourse is to be content with calculating a proxy for $r_{intrinsic}$ (such as an upper bound) and present it as such.

We believe that the basic requirement for estimating $r_{intrinsic}$ from a Leslie matrix (i.e., modeling a depleted population) is largely being overlooked and that there are three different aspects to the problem. First, there is understandable confusion because the standard texts do not emphasize the relationships between $r_{intrinsic}$, $r_{conditional}$, and $r_{predicted}$. For example, one textbook (Gotelli 1998) defines the symbol r as the intrinsic rate of increase and then estimates r for a virgin population and after 50% of the population is removed. We see these problems translated to the elasmobranch literature, with such findings as positive values for the "virginal intrinsic rate of increase" (implying that an unexploited population will increase exponentially forever; Xiao and Walker 2000).

Second, the perception that an intrinsic rate of increase can easily be obtained from a Leslie matrix or life table negates the importance of advancing the field through development of new techniques. The importance of collecting additional information is thus missed. Third, the results from demographic analyses are being used as the basis for management recommendations that will not be effective in achieving their stated goals. A demographic model for any species that uses "normal" age-specific survival rates (e.g., those based on Chen and Watanabe 1989 or Peterson and Wroblewski 1984) should result in a population growth rate of zero and not an estimate of $r_{intrinsic}$. Any other calculated value results from measurement error or noise in the data and is thus probably a substantial underestimate. The resulting conclusion that only extremely low fishing mortality can be tolerated and that modest levels of bycatch may lead to stock collapse and possibly extinction is simply untenable because the analysis is logically flawed. One may argue that this procedure is "conservative" in the short term, but it is not a rational basis for management. Scientifically, the results are erroneous and their use may lead to misunderstanding and to scientists' loss of credibility.

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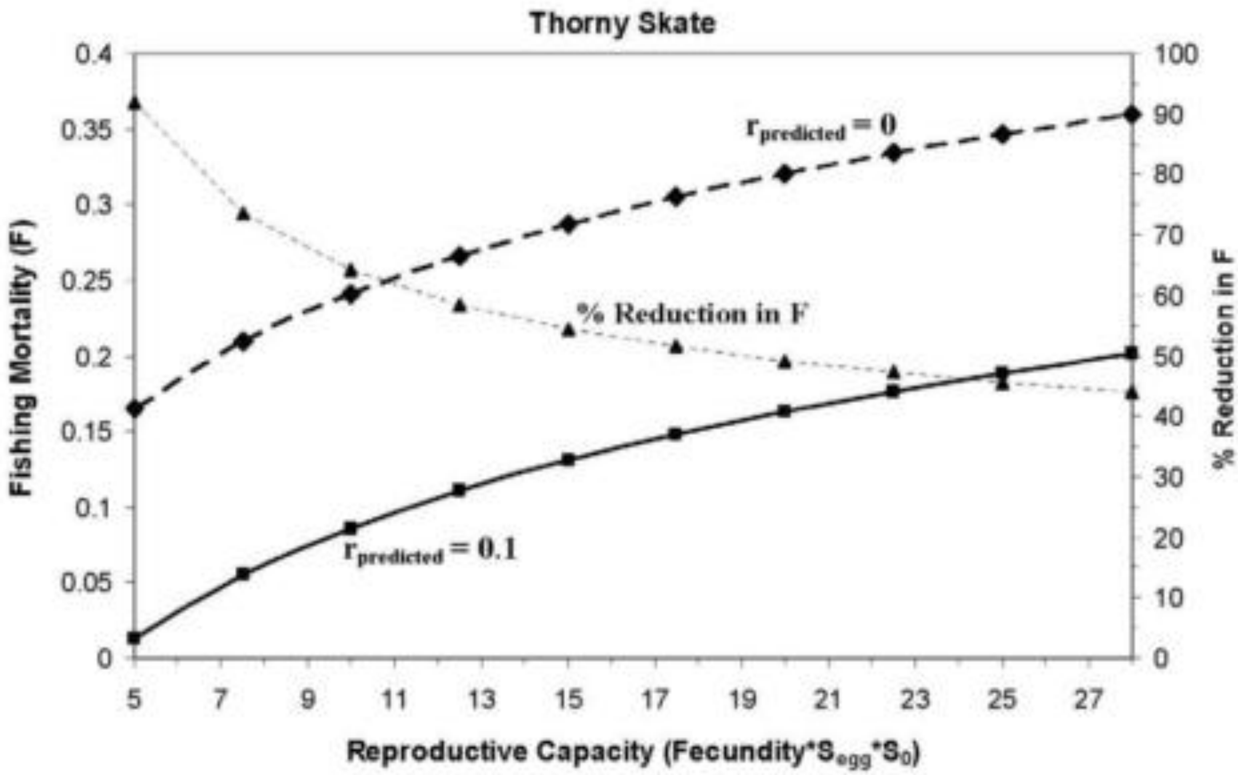

Figure 10. Sensitivity of thorny skate model results to a reasonable range of 'reproductive capacity' parameter estimates. Reproductive capacity is defined here as the product of fecundity (the number of female eggs produced in a year), egg survival rate (S_{egg}), and the survival rate during the first year of life (S_0). See text for further explanation.

7. Document 7

Using a Leslie Matrix Demographic Model to Explore the Population Dynamics of Winter and Thorny Skates

Gedamke 2007

Using a Leslie Matrix Demographic Model to Explore the Population Dynamics of Winter and Thorny Skates in the Northeast United States

by

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Introduction

The task of assessing the status of winter skate (*Leucoraja ocellata*) and thorny skate (*Amblyraja radiata*) stocks in the northeast United States is particularly challenging due to limited species specific life history information and a lack of data on total catch. Without a time series of removals (either discards or landings), alternatives to the commonly used suite of assessment techniques (e.g. production models) must be explored. In this analysis we use newly derived life history parameters to construct a basic Leslie matrix demographic model and incorporate information from the (Northeast Fisheries Science Center) NEFSC trawl survey to gain insights into the population dynamics of both species.

In a recent paper, Gedamke et al. (2007) provided a detailed description on the use and limitations of elasmobranch demographic modeling and only a brief summary relevant to our current application will be provided here. The objective of the present study, which is common to many demographic analyses, is to explore how winter and thorny skate populations respond different levels of fishing pressure. A basic life-table or Leslie matrix demographic model is one approach that has the potential to address this question by estimating the rate of population growth given a fixed set of life history parameters (i.e. age specific schedule of survival and reproduction). Alternatively, the model can be thought of as providing the current (short-term) rate of population change under current conditions. For many elasmobranchs, as is the case for the winter and thorny skate, the question is to what extent these populations can withstand, and how they respond to, fishing pressure.

The challenge of this approach is to recognize that that these models require a great deal of information and are generally density independent in their structure. They will provide an instantaneous rate of population growth for a specified set of life history traits which will only correspond to a specific population size. In reality, at least some life history traits must be pliable and able to respond to the changes in population size that would result from differing levels of fishing mortality. This forms the basic logic behind density-dependent compensation which explains why populations rarely go extinct and cannot grow beyond the bounds fixed by limiting factors (such as food resources or space) for extended periods (i.e., there is a carrying capacity of the environment). Although recent studies have provided empirical estimates for some of the basic life history parameters for both the winter and thorny skates, all of the information to parameterize a Leslie model even for a single stock size is simply not available. With further information on early life history survival and an estimate of the current fishing mortality rate a more precise model for a single stock size could be constructed and density dependent population dynamics could begin to be explored (Gedamke et al. 2007).

A useful analysis and some insights as to the population dynamics of the winter and thorny skates are still possible despite the limitations just described. We first can construct a Leslie matrix using the best available estimates for life history parameters and compare the predicted rate of growth to that which has been observed. This will initially serve as a check on the realism of life history parameters used in the model. Under conditions of no fishing pressure, the predicted rate of growth should not only be reasonable but also as high as what has been observed. For example, Grusha (2005) found questionable parameter values in the literature for the cownose ray *Rhinoptera bonasus* which led to predictions that the population would crash under no fishing pressure unless first year survival exceeded 100%. On the other hand, and clearly subjective, the population should not be predicted to grow unreasonably fast.

Once the baseline parameters have been evaluated, information from the NEFSC trawl survey can be used to estimate the actual, or observed, rate of growth (or decline) that is occurring in the population. Fishing pressure can then be included in the model so that the predicted rate of growth (or decline) matches that which is observed. For our purposes we can then reduce fishing pressure and see how the predicted population growth rate responds.

Model Development and Results

Basics of Demographic Analysis (modified from Gedamke et al. 2007)

Demographic analysis simply tracks the change over time in number of animals at different ages or stages given a schedule of age (or stage) specific reproductive output and mortality (Gotelli 1998; Caswell 2001). To illustrate how the models are constructed, suppose we have the following information which would be required for an age-based demographic analysis of a viviparous species: age at maturity (a_{mat}) = 3 years, longevity (a_{max}) = 6 years, survivorship at each age ($S_0, S_1, S_2 \ldots, S_5$), and the production of females per female ($f_1, f_2, f_3 \ldots, f_6$) which is a function of the percentage reproducing in each age class, frequency of births, sex ratio, and litter size. We assume numbers are tallied before reproduction takes place (pre-breeding census). We can then calculate from the number of females at each age ($n_{1,t}, n_{2,t}, \ldots, n_{6,t}$) the numbers of females there will be in the following year ($n_{1,t+1}, n_{2,t+1}, \ldots, n_{6,t+1}$) where n_{ij} is the number of animals of age i at the start of year j. The number of age-0 females produced will be:

$$n_{1,t+1} = S_0 \sum_{i=1}^{6} n_{i,t} f_i \,. \tag{1}$$

The number of females at all other ages is given by:

$$n_{i+1,t+1} = n_{i,t} \, S_i \,. \tag{2}$$

Often, the age-specific fecundities can be modeled, at least approximately, as the product of age-specific proportion mature, P_i, and a constant fecundity per mature adult, f, i.e., $f_i = P_i f$. This assumes fecundity of mature animals does not change with age.

These basic relationships are fundamental to any demographic analysis including life tables, matrix analysis, and Euler-Lotka approaches. In a Leslie matrix analysis the life history information for our example is organized in a projection matrix **A** as:

$$\mathbf{A}=\begin{bmatrix} 0 & 0 & S_0 f_3 & S_0 f_4 & S_0 f_5 & S_0 f_6 \\ S_1 & 0 & 0 & 0 & 0 & 0 \\ 0 & S_2 & 0 & 0 & 0 & 0 \\ 0 & 0 & S_3 & 0 & 0 & 0 \\ 0 & 0 & 0 & S_4 & 0 & 0 \\ 0 & 0 & 0 & 0 & S_5 & 0 \end{bmatrix} .$$

For our application to the thorny and winter skates which are oviparous species with an egg stage lasting approximately one year, the matrix has an additional row and column to accommodate the egg stage. The first row of the matrix has entries representing the product of fecundity (female eggs/year) and egg survival (S_{egg}). The second row has S_0 in the first column and zeros elsewhere, and each subsequent row would have a single survival rate corresponding to the next age class.

The number of females at each age at time t is denoted by:

$$\mathbf{N}_t = \left[n_{1,t}\,,\, n_{2,t}\,,\, n_{3,t}\,,\, n_{4,t}\,,\, n_{5,t}\,,\, n_{6,t} \right]^{\mathbf{T}}.$$

The female population at time t + 1 is then given by

$$\mathbf{N}_{t+1} = \mathbf{A}\,\mathbf{N}_t \tag{3}$$

The predicted rate of population increase ($r_{predicted}$) is defined here to be the instantaneous rate of growth of the population given the parameters used in the projection matrix and a stable age distribution. It is directly related to the largest eigenvalue (λ) of the matrix **A** as $r_{predicted} = \log_e(\lambda)$ (Vaughan and Saila 1976). The matrix was constructed and analyzed using the PopTools (version 2.7.5) add-in to Microsoft Excel (Hood 2006).

Application to Winter and Thorny Skates

Available estimates for the life history parameters for both species were taken from the literature and are presented in Table 1. Age at maturity is reported to be approximately 11 years for both species and the oldest observed ages were 20.5 and 16 years for the winter and thorny skate respectively (Sulikowski et al. 2005a, Sulikowski et al. 2005b, Frisk and Miller 2006, Sulikowski et al. 2006). Given the oldest observed ages, longevity was assumed to be 25 years for both species.

Valuable information on the fecundity for both species has recently become available from a breeding program that was conducted at the Montreal Aquarium (Parent et al. 2007). Gestation period for both species was reported to be approximately 1 year for both species and the matrix was constructed with an additional row (26 x 26) to accommodate the egg stage as described in the "Basics of Demographic Analysis" section. Although estimates of fecundity were reported, an important aspect of their methodology should be noted. The mean annual egg production for both species (40.5 eggs/year for the thorny skate and of 48.1 eggs/year for the winter skate) was simply calculated by dividing the total number of eggs by the total number of females (7 for winter and 2 for thorny) for each species without knowing the actual number that were reproducing. As such, these represent minimum estimates of egg production (see Discussion for further details). Egg survival was also reported to be 59% and 38% for the winter and thorny skates respectively. An approximate 1:1 sex ratio was reported and used to calculate fecundity for the model (the number of female eggs per female).

Estimates of natural mortality (M) were calculated from the life history information in Table 1 using four different methods: Pauly (1980), Hoenig (1983), and Jensen's (1996) age at maturity and k methods (Table 2). For the thorny skate estimates ranged from 0.15 yr^{-1} to 0.2 yr^{-1} based on the von Bertalanffy parameters reported for females (k=0.13, L_{inf} = 120 cm; Sulikowski et al. 2005a), a longevity of 25 years, an age at maturity of 11 years (Sulikowski et al. 2006) and a water temperature of 8.5^0 C as reported by Myers et al. (1997). For the winter skate estimates ranged from 0.09 yr^{-1} to 0.17 yr^{-1} based on the von Bertalanffy parameters reported for females (k=0.059, L_{inf} = 137.4 cm; Sulikowski et al. 2003), a longevity of 25 years, an age at maturity of 11 years (Sulikowski et al. 2005b) and a water temperature of 8.5^0 C as reported by Myers et al. (1997). Not enough information was available to calculate age-specific rates so these natural mortality estimates were assumed to apply to all ages.

A base case scenario for each species was established using the minimum fecundity estimates and life history information just described (Table 3). The model was constructed with no fishing pressure and population growth rate ($r_{predicted}$) was estimated. The base case parameter inputs resulted in an $r_{predicted}$ of 0.19 and 0.14 yr^{-1} for the winter and thorny skates, respectively. A limited sensitivity analysis was then conducted by varying a single parameter within a reasonable range and estimating a new $r_{predicted}$. For the winter skate varying a single input parameter resulted in an $r_{predicted}$ that ranged from 0.15 to 0.25 yr^{-1} and for the thorny skate predictions were slightly less ranging from 0.10 to 0.22 yr^{-1}.

Given the uncertainty in parameter inputs and to ensure that the model explored a comprehensive range of possibilities, scenarios representing the most optimistic (i.e. most productive parameter inputs) and least optimistic (i.e. least productive parameter inputs) were constructed (Table 3). For both species, the least productive scenarios were constructed using the minimum fecundity estimates and decreased survival rates for all ages. In the case of the thorny skate, the 'least productive scenario 1' resulted in an negative $r_{predicted}$, which is not reasonable under conditions of no fishing pressure, so S_{egg} and S_0 were raised slightly in to produce a more realistic $r_{predicted}$ of 0.05 yr^{-1} (thorny 'least productive scenario 2'). For the 'most productive scenario 1', the model predicted maximum population growth rates of 0.33 and 0.30 yr^{-1} for the winter and thorny skates, respectively. In the 'most productive scenario 2', high values for survival rates and fecundity were used but, in addition, age-at-maturity was also assumed to be capable of responding to the density-dependent processes and reached at an earlier age of 9 years for both species. Thus, at an upper bound, the most productive and optimistic parameter inputs resulted in an $r_{predicted}$ of 0.39 and 0.36 yr^{-1} for the winter and thorny skates, respectively.

Incorporating Information from the NEFSC surveys and Fishing Mortality

The next step in the analysis was to evaluate the size frequency composition and population trends observed in the NEFSC bottom trawl survey. Although the use of the spring and winter surveys was explored, only data from the autumn survey is presented here. The autumn survey provides the longest time series of data and the overall trends and conclusions were similar to that of the other two surveys. For the thorny skate, the Gulf of Maine and Southern New England offshore strata were used while for the winter skate the Gulf of Maine to Mid-Atlantic offshore strata were used.

Initially, a cumulative size frequency plot was used to determine the size (and age) at full vulnerability to the survey gear (Figures 1 and 2). Although the size of vulnerability to the survey gear is likely to be different than that of the commercial fisheries this provides a good starting point to determine when fishing mortality should be included in the model. The von Bertalanffy parameters were then used to convert size to age. The age at full vulnerability (T_c) to the survey gear was estimated at between 1 and 4 years, and 4 years old for the thorny and winter skates, respectively.

Historical population trends for both species were then evaluated to estimate observed rates of population change through log transformed catch rates. Winter skate increased in abundance during the 1970's and early 1980's, declined slightly in the late 1980's and early 90's and has remained relatively constant since the early 1990's (Figures 3 and 4). The time series were broken up into segments and used to estimate a maximum observed population growth of 0.17 yr^{-1} between 1975 and 1987 and a maximum decline of -0.14 yr^{-1} between 1987 and 1993. The thorny skate, on the other hand has exhibited no obvious population growth during the entire time series (Figures 4 and 5). The population declined at a gradual rate of - 0.026 yr^{-1} between 1963 and 1994, and then at an accelerated rate of -0.23 for the five year period between 1993 and 1998. Since 1998 the population has exhibited no clear trend and appears to have somewhat stabilized.

Given the very noisy, yet relatively stable trend in the recent past for both species, a recent growth rate of zero was assumed for both species. In our model, fishing pressure was then applied to ages T_c and above until $r_{predicted}$ equaled the observed growth of 0. The model was then solved with the same input parameters for the fishing mortality rate (F) which would result in a population growth of 0.1 yr^{-1}. The percent reduction in F required to change the population trajectory from 0 to 0.1 yr^{-1} was then calculated. Since the T_c of the commercial fishery is likely to be different to that observed in the survey data a sensitivity analysis to all possible T_c's was conducted (Figure 7 and 8). Using the base case parameters, the analysis was relatively insensitive to the range of T_c's (1-6 years) that are likely to be present in the commercial fishery. Results only began to show significant differences when T_c began to approach the age at maturity (11 years) when very high fishing pressures were required to realize an $r_{predicted}$ of 0.

Since the base model included estimates of fecundity that are lower bounds and density dependent compensation is likely to occur in the early life history, a range of possibilities was explored. The product of fecundity, S_{egg}, and S_0, defined here as "reproductive capacity", was manipulated to represent the entire range and extreme possibilities for the combination of these parameters (see Gedamke et al. 2007 for further discussion). At the lower end of the spectrum the minimum estimates of fecundity, an S_{egg} of 0.25, and a S_0 of 0.25* S_{adult} were used. For the upper bound, fecundity was doubled, a S_{egg} of 0.75 was assumed, and an S_0 equal to that of adult was used. For both species, the lowest reproductive capacity scenarios required extremely low, or impossibly low F for the population to grow at a rate of 0.1 yr^{-1} (Figures 9 and 10). Thus the % reduction necessary in F to change the population trajectory from 0 to 0.1 yr^{-1} was extremely high or not definable. For the most productive reproductive capacity scenarios the necessary % reduction in F began to stabilize and approach a lower bound at values of 35% and 44% for the winter and thorny skates respectively.

Following the same logic just described for the reproductive capacity and assuming that survival rates are also underestimated, we can generate a lower bound for the necessary % reduction by using the parameters for the most optimistic scenarios (i.e. most productive scenarios) presented in Tables 3 and 4. Assuming that age at maturity is estimated correctly at 11 years for both species, a minimum reduction in F of 31% and 34% would be required for the winter and thorny skates respectively. If age at maturity was actually reduced by two years, as in the most productive scenario 2's, a minimum reduction of 26% and 28% would be required for the winter and thorny skates, respectively.

Discussion

A brief discussion of density dependent processes was included in the introduction to this study to ensure that these considerations were kept in mind for both the development of the methodology and the interpretation of results. The fundamental logic of density dependent compensation and how it fits into a basic demographic modeling structure that uses static life history parameters is commonly overlooked (Gedamke et al. 2007). Only with careful parameterization that acknowledges both density dependent processes and recognition of the limitations of the available information can meaningful results be produced. First, one must recognize that a population will have the potential to grow at a maximal rate ($r_{intrinsic}$) only in a depleted condition when competition for resources, such as food and space, are at a minimum. When the population is at or near its carrying capacity (i.e. virgin), on the other hand, density dependent compensation will result in reduced survival and/or reproductive rates and will result in an average long-term growth rate of 0. Thus, to accurately gauge a population's potential to respond to changes in fishing pressure, as in our case, the model must use parameters that reflect the survival and reproductive rates that would occur at the corresponding stock size. In our case, we are assuming that the populations are depleted and that these rates should be at a maximum.

The problem lies in obtaining accurate parameter estimates that correspond to stock sizes and, in our case, for maximal survival and reproductive rates. Although there are indirect methods for estimating parameters for which no empirical evidence is available (e.g. adult mortality from the von Bertalanffy parameters), these methods describe generalized and "normal" relationships and are not capable of providing the species- and age-specific maximal rates that are required. Even in the most well studied species, it remains extremely difficult to obtain appropriate estimates for those parameters that are likely to be pliable due to density dependent compensation (e.g. fecundity, juvenile and first year survival, egg survival etc.).

In our application to the winter and thorny skates, the problem is compounded by uncertainty in even some of the basic parameters necessary to construct the model. As such, it is not possible to provide reliable absolute estimates for maximum potential population growth rates ($r_{intrinsic}$) or for the fishing mortality rates in our analysis. However, by keeping in mind the logic of density dependent compensation, how vital rates are likely to respond to changes in stock size, and the available information on skate life histories and observed trends, we can provide a reasonable interpretation of the results even given the uncertainty in parameter estimates.

Let us first consider our base model which was constructed under conditions of no fishing mortality; this represents the potential population growth rate given the specific set of input parameters. If we knew which parameters corresponded to the maximum rates which would be realized in the depleted condition, our $r_{predicted}$ in Tables 3 and 4 would represent $r_{intrinsic}$. A comparison of our $r_{predicted}$ to that which has been observed in the NEFSC survey can provide some insights as to the feasibility of input parameters. In our base case for the winter skate, for example, the population is predicted to grow at a maximal rate of 0.14 yr^{-1} while the population was observed to be growing at a rate of 0.17 yr^{-1} between 1975 and 1987. During this time period there was clearly some fishing pressure that was occurring, and although some researchers believe that some of the recently observed growth may be due to immigration (M. Frisk pers. comm.), this seems to indicate that the potential growth rate of the winter skate is likely to be slightly underestimated in the base case scenario. As such, the base case parameters for the winter skate could reasonably be assumed to represent a lower bound of potential growth. Applying the same thought process to the thorny skate, on the other hand, is problematic because the population trend has never exhibited any distinct positive growth since the beginning of the time series. Clearly there have been changes, including reductions, in fishing mortality during this time period and no clear response was realized in the rate of population change estimated from the NEFSC survey. Solving the model to match the maximum observed decline (-0.23 yr^{-1}) using the most optimistic parameters would require a high, but not unrealistic, F of just over 1.0 yr^{-1} providing no evidence that our range of input parameters is unreasonable.

As we take the model one step farther and begin to explore the reduction in fishing mortality that would be required to change the population trajectory from a rate of 0 to 0.1 yr^{-1}, recognizing the uncertainty that exists in our parameter estimates is critical. This is why the results of the analysis were not presented as individual absolute estimates but rather as a family of solutions that would result in the population growth rates of interest. Since the interpretation of results relies on upper and lower bounds for parameter inputs and this process can be viewed as somewhat subjective, some further discussion on the origin and the determination of the potential range for questionable parameters is warranted.

The greatest uncertainty in parameter estimates which could significantly affect the results is reflected in the sensitivity analysis for 'reproductive capacity' which is presented in Figures 9 and 10. Although the study from the Montreal Aquarium has provided some species specific observations of captive breeding, comparable information for the fecundity and egg survival rates for skate species in the literature is limited.

Holden (1974) reported that skate species of genus *Rajidae* are the most fecund of all elasmobranches and can lay 100 egg cases per year. Evidence from the Montreal Aquarium breeding program supports this finding with a single barndoor skate (*Dipturus laevis;* formerly *Raja laevis*) producing 69, 85 and at least 100 eggs in 2005, 2006, and 2007 respectively (Parent et al. 2007; Parent pers. comm.). Unfortunately in the Montreal Aquarium study the exact number of reproducing females was unknown for the winter and thorny skates and the estimates (40.5 and 48.1 eggs per year for the winter and thorny respectively) used in the parameterization of the model clearly represent lower bounds. It is likely that some of the females in the tank were not reproductive and the actual egg production for both species is higher. For the thorny skate, for example, there were two individuals in the tank and if only one were laying eggs the annual estimate would be increased to 81 per year. For the winter skate, there were seven individuals in the tank and if only three or four were actually laying eggs, the annual estimate would be increased to 84 to 112 eggs per year. These higher estimates are consistent with what has been observed for the barndoor skate and forms the basis for the upper limit of fecundity explored in our analysis.

Similarly, our base case model assumed an egg survival rate of 50% based primarily on the Montreal Aquarium observed success rates of 38%, 59% and 73% for the thorny, winter and barndoor skates respectively (Parent et al. 2007). Additional supporting evidence on hatching success for skate species was limited. Smith & Griffiths (1997) reported a predation rate of 14% and an overall egg survival rates ranging from 47% to 60% from egg cases collected on two South African beaches. It is not unreasonable to think that survival rates might even be higher than those reported by this study if eggs had been incubated in their natural environment and not subjected to a surf zone or air exposure. Predation rates on thorny skate eggs have been reported at between 4.6% and 18% off the Danish coast (Cox et al. 1999) and a predation rate of 22% was reported for experimentally incubated little skate (*Raja erinacea*) eggs in Maine, USA (Cox and Koob 1993). Considering the observed predation and success rates, it seems likely that egg survival is at least 50% and, under suitable conditions, close to the 75% explored in our sensitivity analysis.

The final parameter that is incorporated into our sensitivity analysis for the reproductive capacity of the thorny and winter skates is survival during the first year of life (S_0). In our base case model S_0 was assumed to be equal to that of an adult. Although it is likely that S_0 is somewhat less than of an adult, the relatively large egg capsules and the one year gestation and development period results in individuals that are born at a relatively large size of almost 12 cm for both species (Parent et al. 2007). At low stock sizes, when competition is at a minimum, this relatively large birth size should result in relatively high survival rates. Although S_0 might be slightly overestimated, the base case scenario for reproductive capacity (i.e. the product of S_{egg}, S_0, and fecundity) will still represent a lower bound given the minimal estimates used for fecundity and S_{egg}. The corresponding % reductions in F (52% for the winter skate; 69% for the thorny skate) necessary to change the population growth rate from 0 to 0.1 yr^{-1} should therefore represent upper bounds.

Although the model was relatively sensitive to the parameters just discussed, age-at-maturity was by far the most influential parameter on the results of the analysis. The importance of age-at-maturity in the world of population dynamics is well known and has been demonstrated in numerous studies (Parent and Schrimi 1995, Myers et al. 1997). Luckily for our work, empirical evidence for the age-at-maturity for both species was available. In our sensitivity analysis we explored only one case ('most productivity scenario 2' for both species) where we assumed that age-at-maturity responded to low densities and could be reduced by two years. In conjunction with the high reproductive capacity and survival parameters, this scenario represented a very optimistic upper bound for the productivity of the population and therefore a conservative lower bound for the % reduction in F that would be required to change the population growth rate from 0 to 0.1 yr^{-1}.

Summary and Conclusions

The objective of the present study was to estimate the reduction in fishing mortality that would be required to change the population growth rate from the recently observed rate of near zero to a growth of 0.1 yr^{-1}. The uncertainty surrounding input parameters and a corresponding sensitivity analysis results in a family of solutions rather than single estimates that would meet this goal. In the most optimistic scenarios (highest survival and reproductive rates) that include a younger than observed age-at-maturity, a lower bound of 26% and 28% reduction in fishing mortality would be required for the winter and thorny skates, respectively. If we assume that age-at-maturity remains constant and is accurately estimated at 11 years for both species, then the lower bound for the necessary reduction is increased to 31% and 34% for the winter and thorny skates respectively. The lowest productivity scenarios (i.e. lowest reproductive and survival rates) would result in predicted growth rates less than 0.1 yr^{-1} under no fishing pressure and therefore even a 100% reduction in F would not result in the desired growth. Our base case scenario which utilized average survival rates and minimal estimates for fecundity and egg survival was therefore assumed to represent a more realistic low productivity scenario for both species and provided a reasonable upper bound for the necessary reduction in F. This upper bound for the necessary reduction in F was estimated to be 52% and 69% for the winter and thorny skates respectively. Using best guess estimates, as indicated by middle part of the range in Figures 9 and 10, suggest that reductions in F of approximately 42% for winter skate and 53% for the thorny skate would be required to change the population growth trajectory from 0 to 0.1 yr^{-1}.

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Table 1. Life history parameters used to construct the model. The sources for empirical and observed estimates are provided in the text.

Parameter	Winter Skate	Thorny Skate
L_{inf}	137.4 cm	120 cm
K	0.07 $year^{-1}$	0.13 $year^{-1}$
Age at Maturity	11 years	11 years
Maximum Observed Age	20.5 years	16 years
Assumed Longevity	25	25
Fecundity	48.1 eggs/year	40.5 eggs/year
Gestation Period	~1 year	~1 year
Observed Hatching Success	59%	38%
Assumed Egg Survival (S_{egg})	50%	50%

Table 2. Estimates of natural mortality (M) calculated by four different methods using the life history parameters in Table 1 and a water temperature of 8.5 C (Myers et al. 1997).

Natural Mortality Estimates

Method	Estimated From:	Species	
		Winter	Thorny
Hoenig (1983)	Longevity	0.17	0.17
Pauly (1980)	K, L_{inf}, Water Temperature	0.11	0.18
Jensen (1996)	Age at Maturity	0.15	0.15
Jensen (1996)	K	0.09	0.20
	Mean of all four methods	0.13	0.17

Table 3. Parameters used to construct the Leslie matrix demographic model for the winter skate. The predicted rates of population growth ($r_{predicted}$) and estimated generation times for each parameter set are shown. The base case scenario is shown in bold and for the sensitivity analysis only those parameters that were changed from the base case are indicated. A_{mat} is age at maturity, M_{adult} is adult natural mortality, S_{adult} is adult survival, S_0 is first year survival, S_{egg} is egg survival.

Winter Skate

A_{mat} (years)	Fecundity (female eggs/year)	M_{adult} (S_{adult})	S_0/S_{adult} (S_0)	S_{egg}	$r_{predicted}$	Generation Time (years)	
11	**24**	**0.13 (0.88)**	**1 (0.88)**	**0.50**	**0.19**	**15.4**	Base case
10	-	-	-	-	0.22	14.4	
9	-	-	-	-	0.25	13.3	
-	36	-	-	-	0.22	15.3	
-	48	-	-	-	0.24	15.2	
-	-	0.07 (0.93)	-	-	0.25	15.9	
-	-	0.18 (0.84)	-	-	0.15	15.1	
-	-	-	-	0.25	0.15	15.7	
-	-	-	-	0.75	0.22	15.3	
-	-	-	0.75 (0.66)	-	0.17	15.5	
-	-	-	0.5 (0.44)	-	0.15	15.7	
-	-	0.18 (0.84)	0.5 (0.42)	0.25	0.05	15.6	Least productive scenario
-	48	0.07 (0.93)	-	0.75	0.33	15.5	Most productive scenario 1
9	48	0.07 (0.93)	-	0.75	0.39	13.4	Most productive scenario 2

Table 4. Parameters used to construct the Leslie matrix demographic model for the thorny skate. The predicted rates of population growth ($r_{predicted}$) and estimated generation times for each parameter set are shown. The base case scenario is shown in bold and for the sensitivity analysis only those parameters that were changed from the base case are indicated. A_{mat} is age at maturity, M_{adult} is adult natural mortality, S_{adult} is adult survival, S_0 is first year survival, S_{egg} is egg survival.

Thorny Skate

A_{mat} (years)	Fecundity (female eggs/year)	M_{adult} (S_{adult})	S_0/S_{adult} (S_0)	S_{egg}	$r_{predicted}$	Generation Time (years)	
11	**20**	**0.17 (0.84)**	**1 (0.84)**	**0.5**	**0.14**	**15.3**	Base case
10	-	-	-	-	0.17	14.2	
9	-	-	-	-	0.20	13.2	
-	30	-	-	-	0.17	15.1	
-	40	-	-	-	0.19	15.1	
-	-	0.09 (0.91)	-	-	0.22	15.8	
-	-	0.25 (0.78)	-	-	0.07	14.8	
-	-	-	-	0.25	0.10	15.5	
-	-	-	-	0.75	0.17	15.1	
-	-	-	0.5 (0.42)	-	0.10	15.5	
-	-	-	0.75 (0.63)	-	0.12	15.4	
-	-	0.25 (0.78)	0.5 (0.39)	0.25	-0.02	15.3	Least productive scenario 1
-	-	0.25 (0.78)	0.75 (0.58)	0.5	0.05	14.9	Least productive scenario 2
-	40	0.09 (0.91)	-	0.75	0.30	15.4	Most productive scenario 1
9	40	0.09 (0.91)	-	0.75	0.36	13.3	Most productive scenario 2

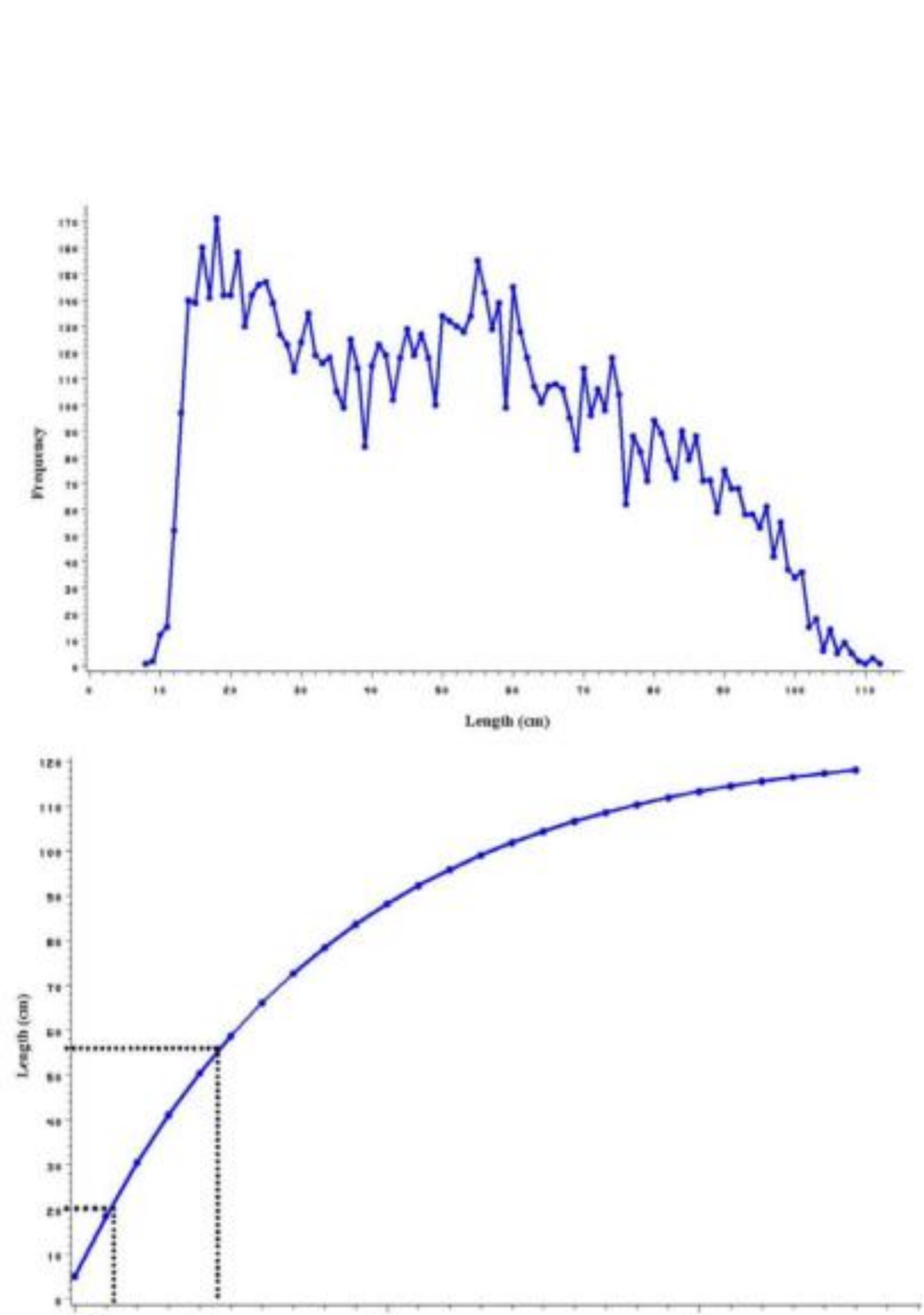
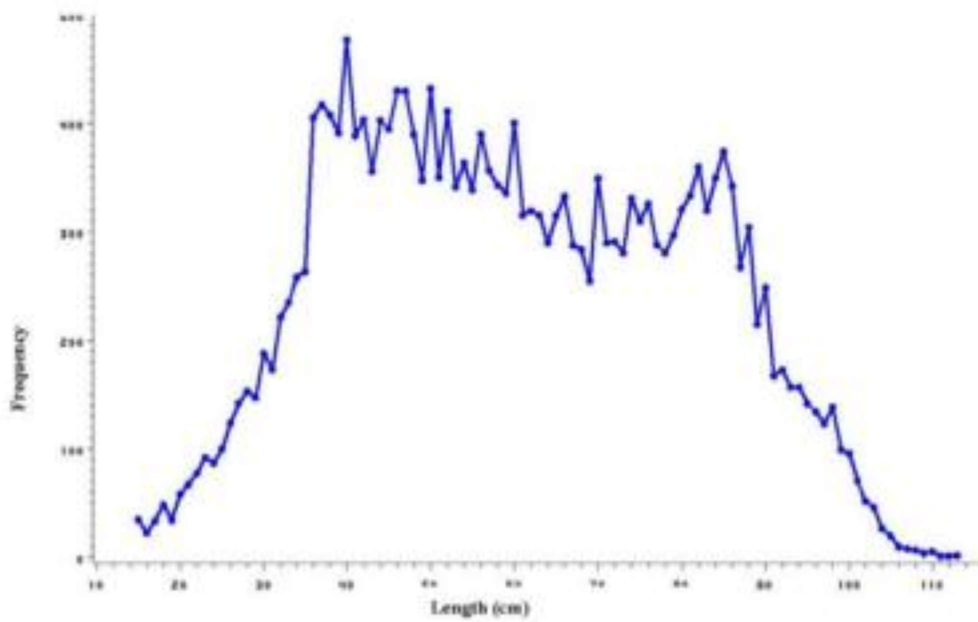


Figure 1. Top) Cumulative frequency distribution of all thorny skates captured in the NEFSC fall survey 1963-2006.
Bottom) von Bertalanffy growth curve for thorny skates with peaks of cumulative plot from top plate and corresponding ages indicated.



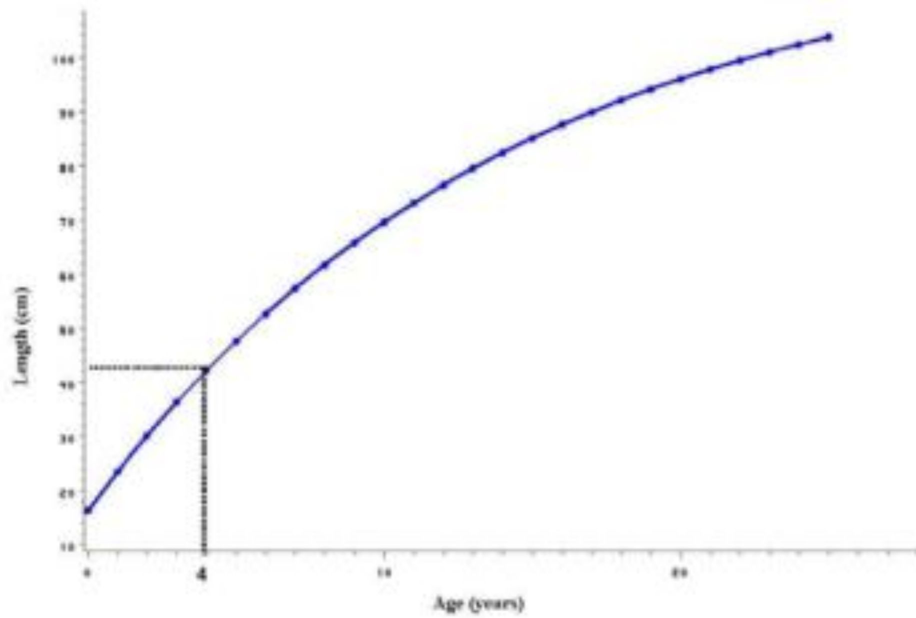


Figure 2. Top) Cumulative frequency distribution of all winter skates captured in the NEFSC fall survey 1967-2005.
Bottom) von Bertalanffy growth curve for winter skates with peak of cumulative plot from top plate and corresponding ages indicated. Note that an L_{inf} of 122 cm from Frisk and Miller (2006) are used for this curve. Age at vulnerability is also indicated at 4 years using Sulikowski et al. (2003) L_{inf} of 137 cm.

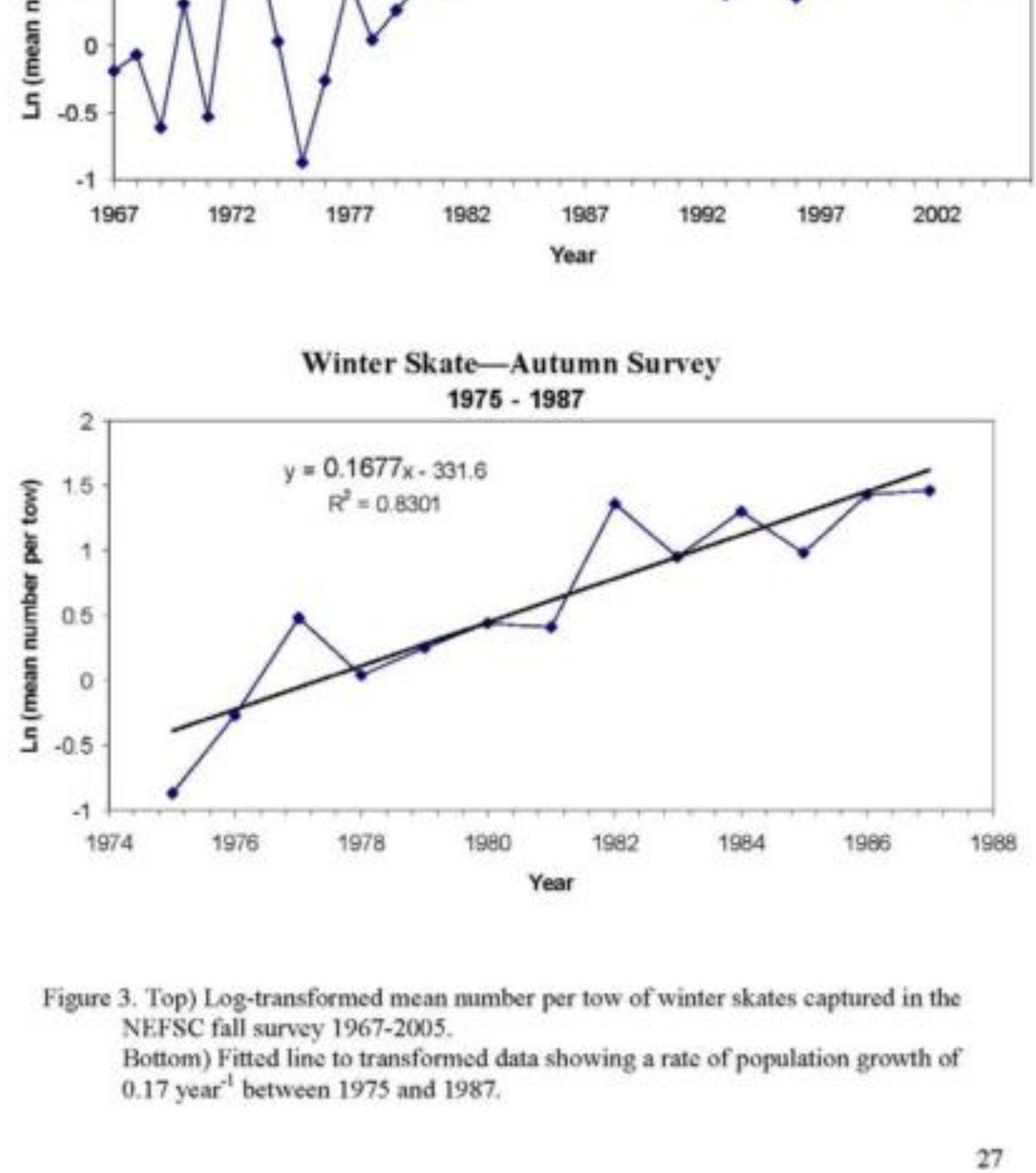
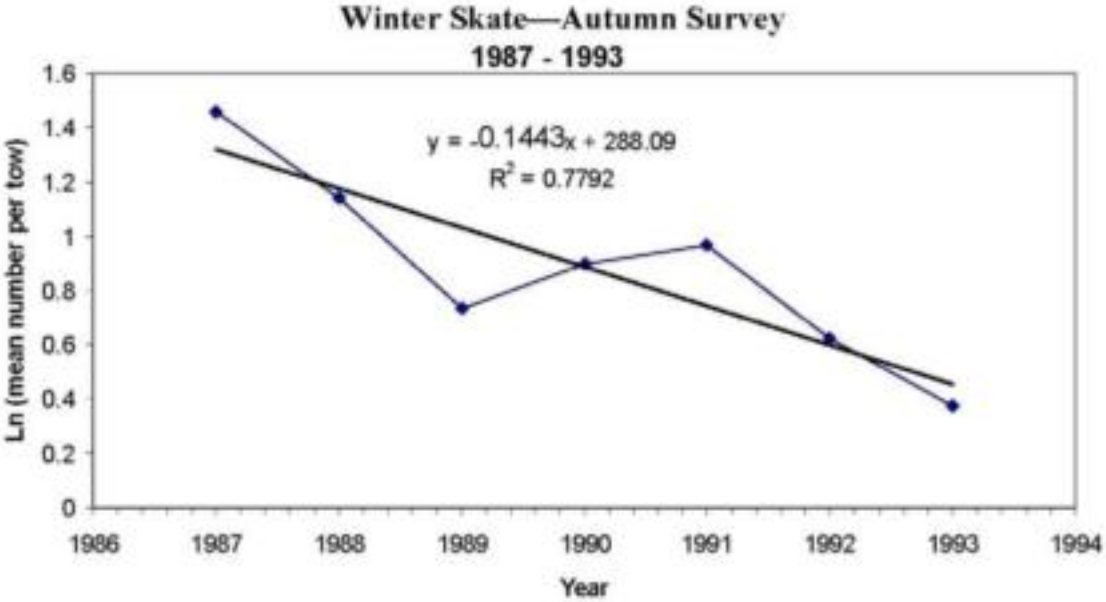


Figure 3. Top) Log-transformed mean number per tow of winter skates captured in the NEFSC fall survey 1967-2005.
Bottom) Fitted line to transformed data showing a rate of population growth of 0.17 $year^{-1}$ between 1975 and 1987.



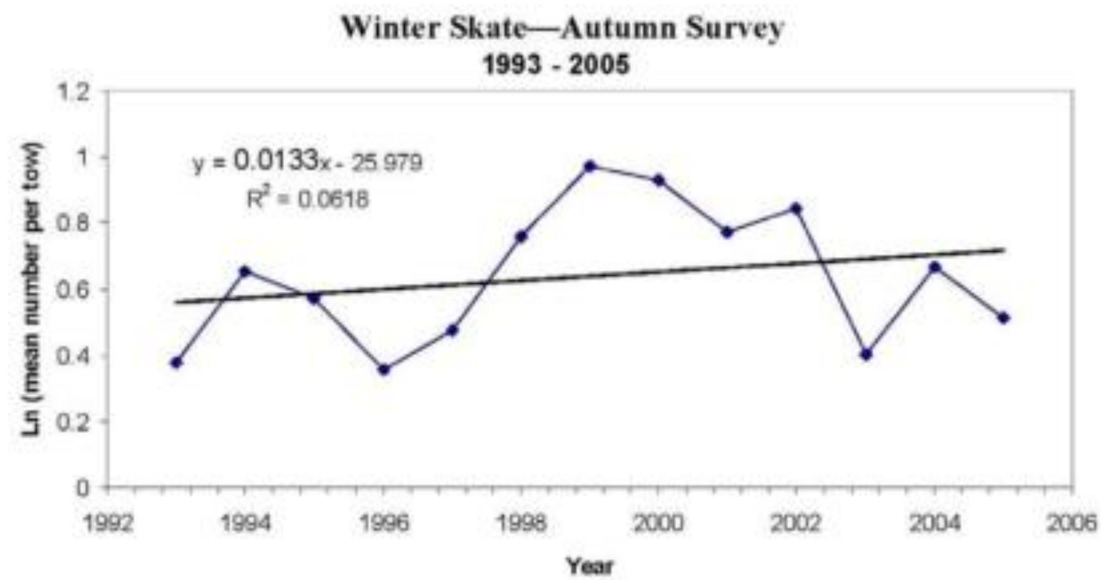
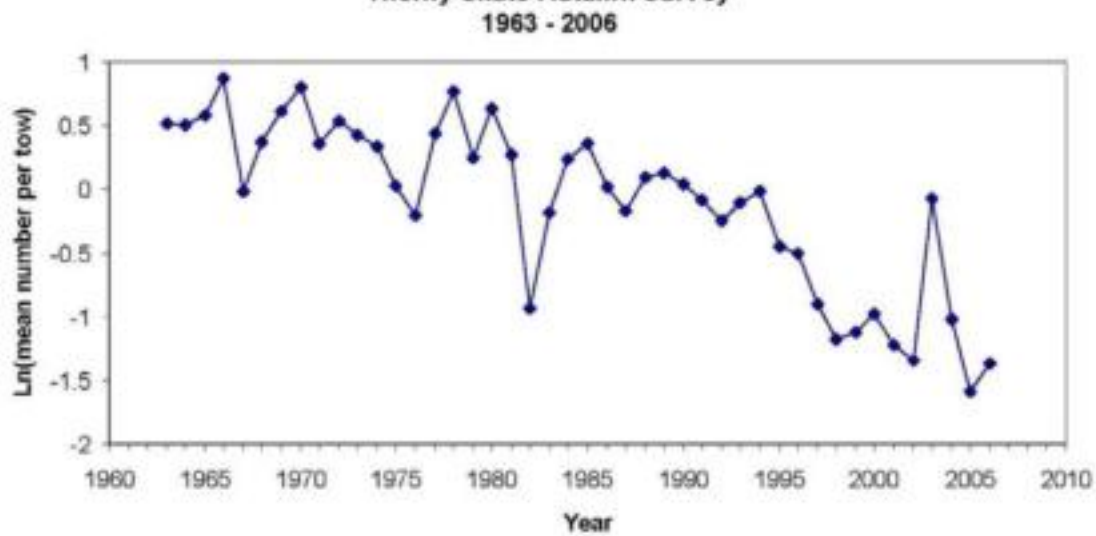


Figure 4. Top) Fitted line to log-transformed data showing a rate of population decline of 0.14 year^{-1} between 1975 and 1987.
Bottom) Fitted line to log-transformed data showing a rate of population change of 0.01 year^{-1} between 1993 and 2005.



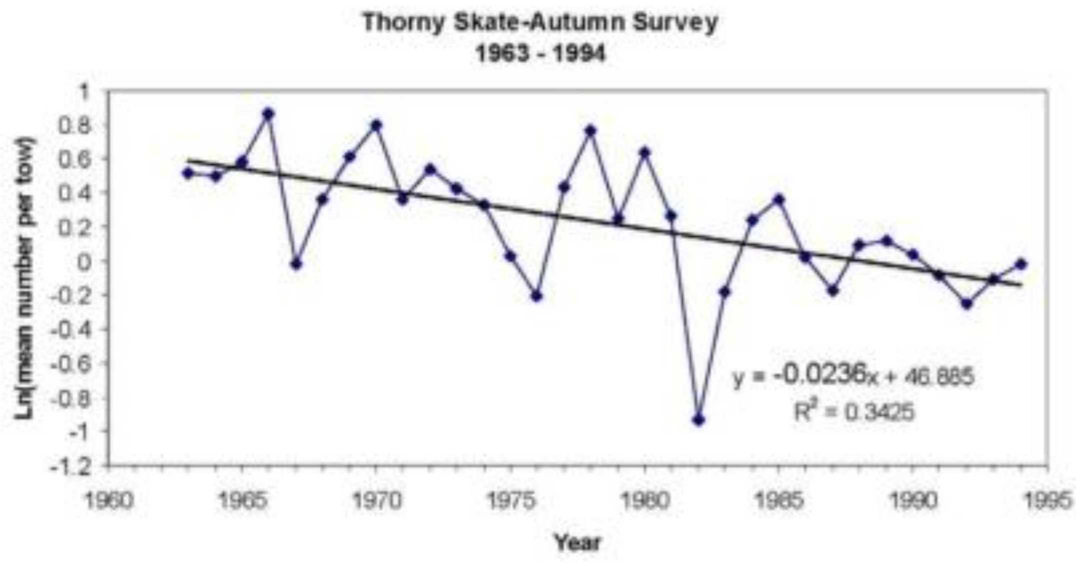
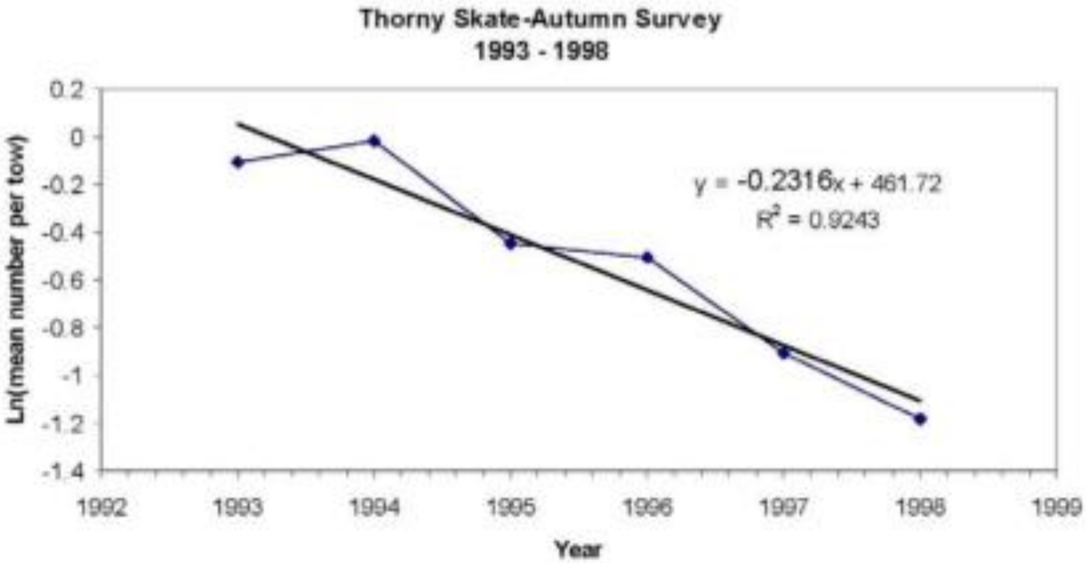


Figure 5. Top) Log-transformed mean number per tow of thorny skates captured in the NEFSC fall survey 1963-2006.
Bottom) Fitted line to log-transformed data showing a rate of population decline of 0.02 $year^{-1}$ between 1963 and 1994.



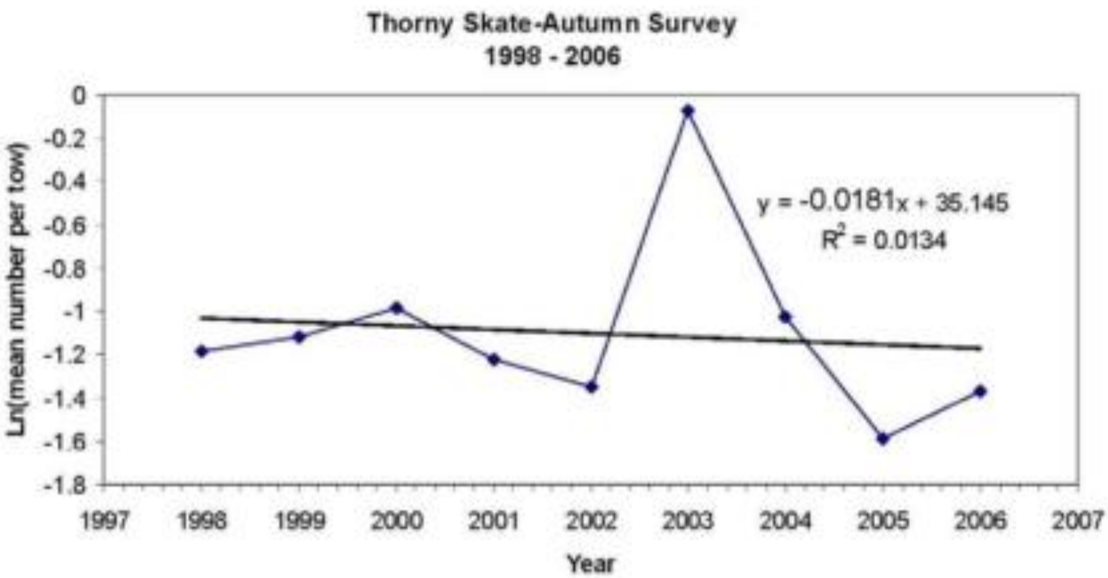


Figure 6. Top) Fitted line to log-transformed data showing a rate of population decline of 0.14 $year^{-1}$ between 1975 and 1987.
Bottom) Fitted line to log-transformed data showing a rate of population change of 0.02 $year^{-1}$ between 1998 and 2006.

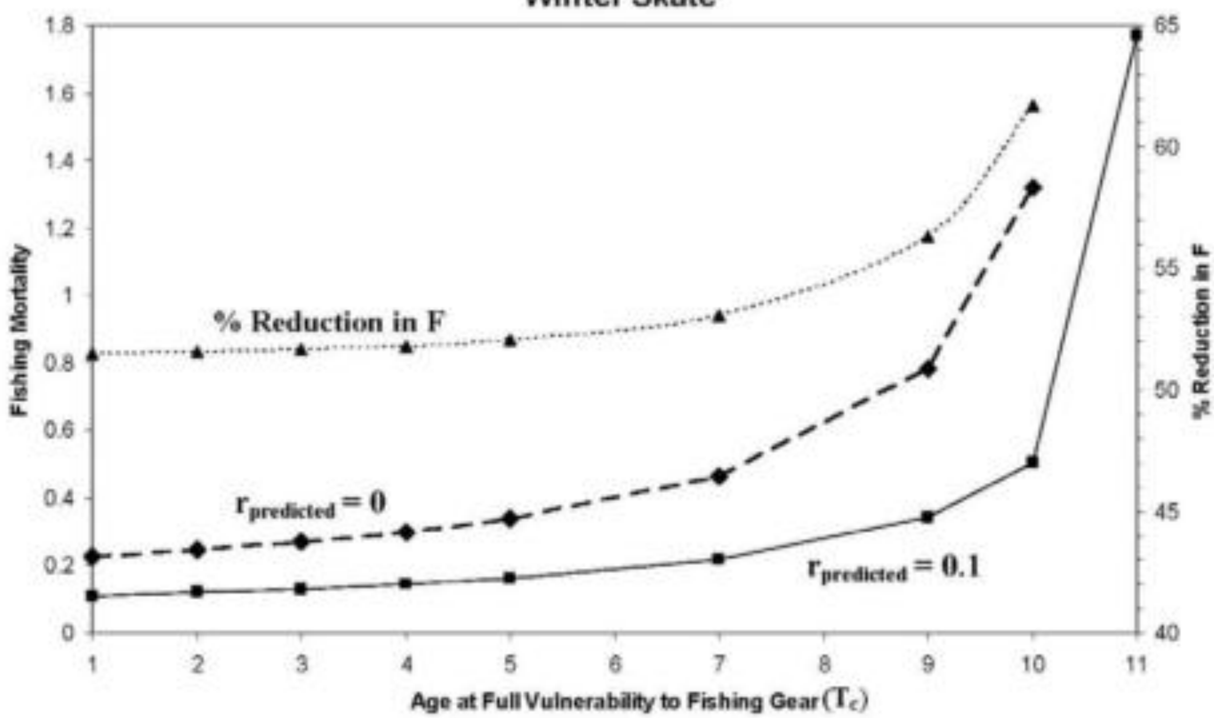


Figure 7. Sensitivity of winter skate model results to the assumed age at full vulnerability to the fishing gear. Selectivity was assumed to be knife-edged. Note that when age at vulnerability is equal to age at maturity (age 11), the equilibrium condition ($r_{predicted} = 0$) could not be achieved.

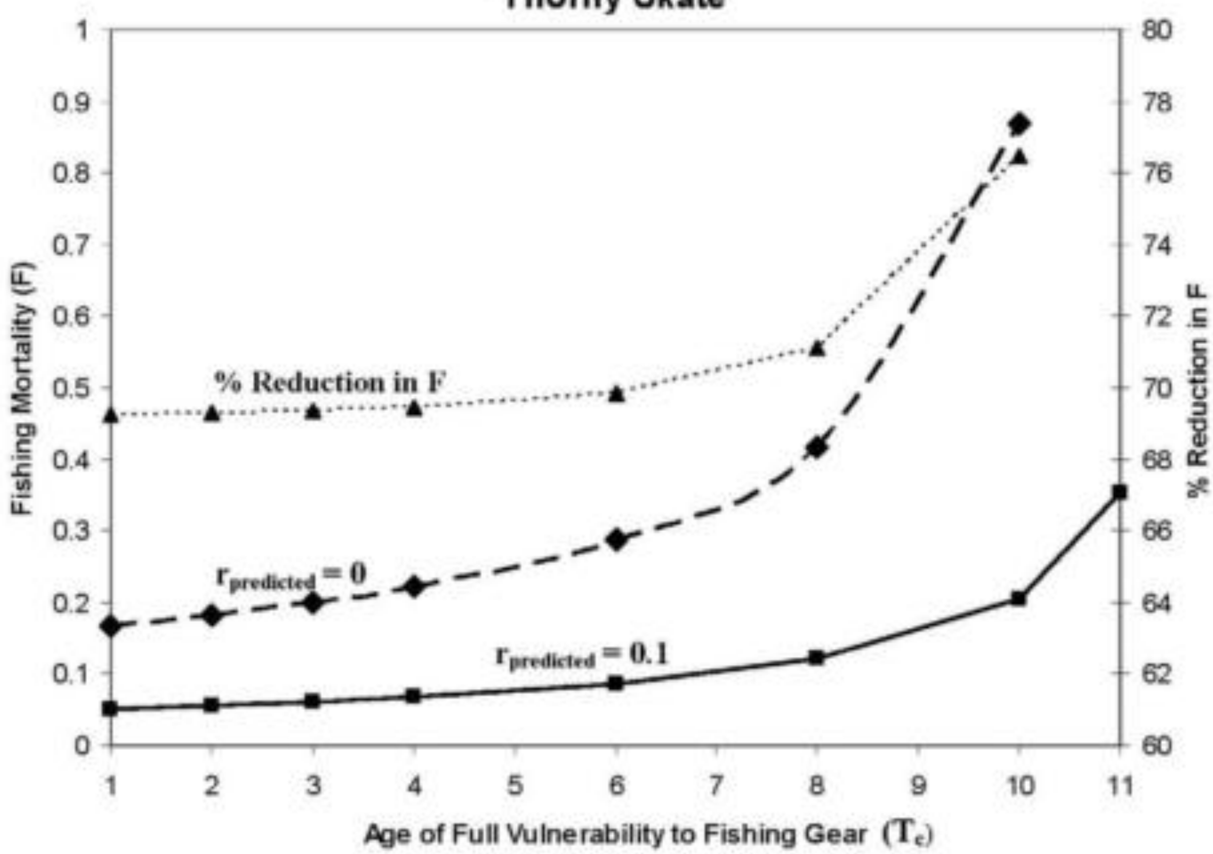


Figure 8. Sensitivity of thorny skate model results to the assumed age at full vulnerability to the fishing gear. Selectivity was assumed to be knife-edged. Note that when age at vulnerability is equal to age at maturity (age 11), the equilibrium condition ($r_{predicted} = 0$) can not be achieved.

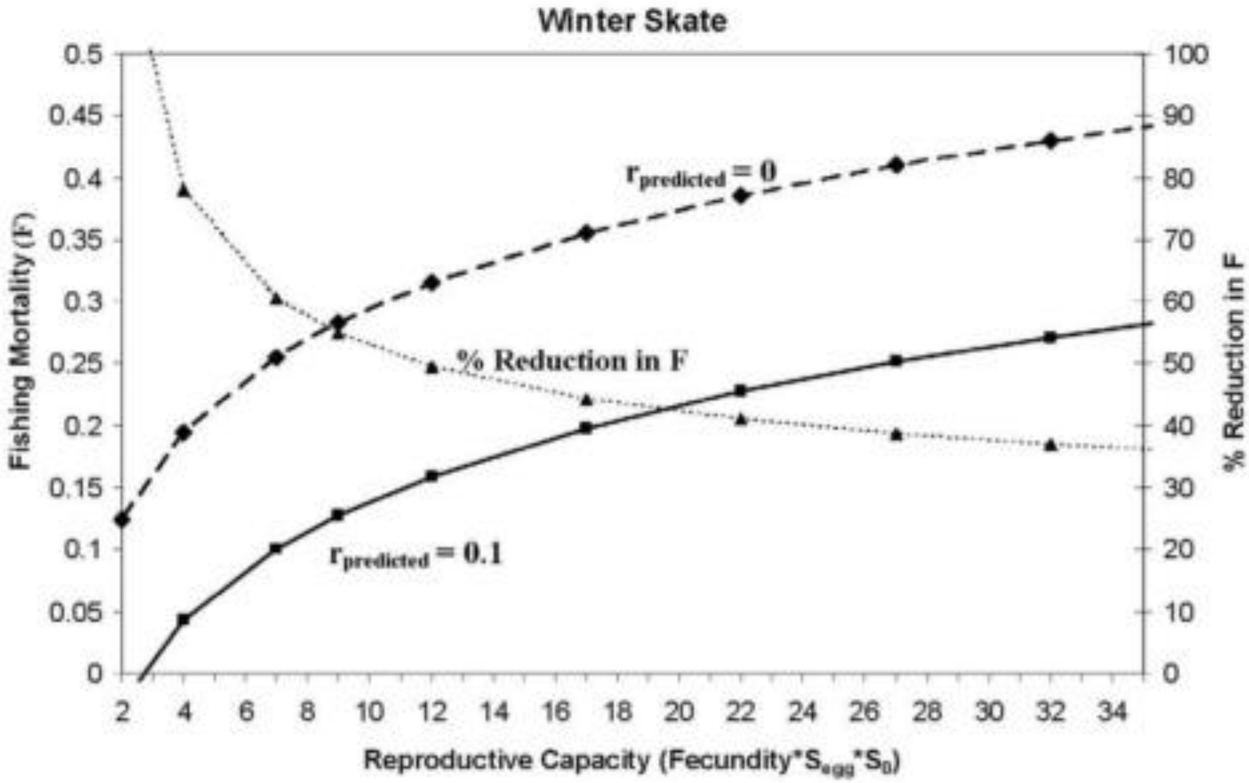


Figure 9. Sensitivity of winter skate model results to a reasonable range of 'reproductive capacity' parameter estimates. Reproductive capacity is defined here as the product of fecundity (the number of female eggs produced in a year), egg survival rate (S_{egg}), and the survival rate during the first year of life (S_0). See text for further explanation.

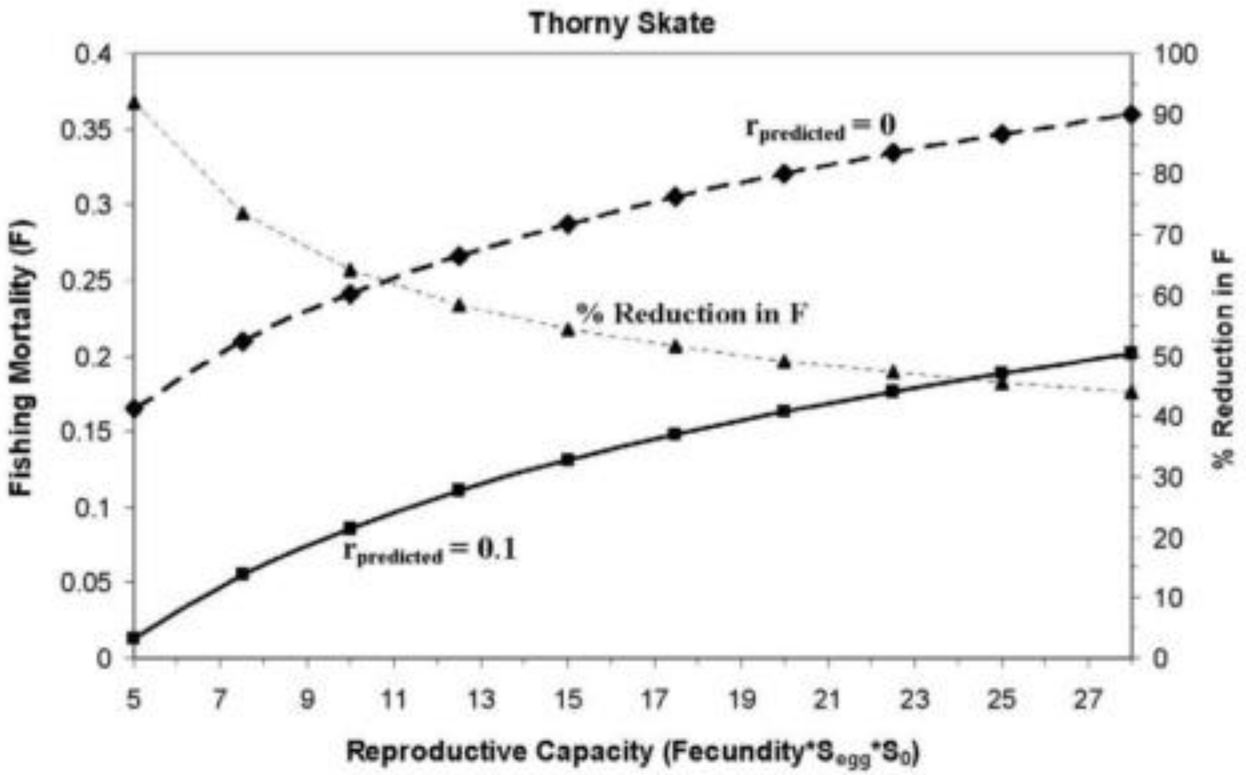


Figure 10. Sensitivity of thorny skate model results to a reasonable range of 'reproductive capacity' parameter estimates. Reproductive capacity is defined here as the product of fecundity (the number of female eggs produced in a year), egg survival rate (S_{egg}), and the survival rate during the first year of life (S_0). See text for further explanation.

8. Document 8

Preliminary Smooth Skate Demographic Analysis and Population Trends

Gedamke et al. 2008

Preliminary Smooth Skate Demographic Analysis and Population Trends
Todd Gedamke
July 30, 2008

Leslie Matrix Demographic Analysis

Limited information is available on the life history of the smooth skate, with no information on fecundity, first year survival, or egg survival.

Natural mortality was estimated indirectly from maximum age, age-at-maturity, and the von Bertalanffy growth parameter (Table 1).

Table 1.

	Smooth Skate Natural Mortality Estimates			
Method:	Hoenig	Pauly	Jensen	Jensen
Parameters used:	Max. age	K, Linf, Water temp	(tmat)	(K)
Estimates:	0.167	0.199	0.183	0.180

There is not enough information from the survey indices to provide clear population trends and annual rates of increase that could be used to gain insights and narrow estimates for the unknown life history parameters. Thus, a sensitivity analysis over a reasonable range of input values was conducted (Table 2).

The base case scenario (first line in table) predicts a population growth rate of 0.2 yr^{-1} but given the uncertainty in the inputs estimates could range from 0 (clearly infeasible but without additional information it is impossible to determine which input parameters are in error), to a maximum of 0.35 yr^{-1}.

If the observed growth of 0.12 yr-1 in the spring survey is valid (see Survey Trends below) and not simply a result of noisy data then the maximum population growth rate is bound from 0.12 to 0.35. Thus the base case model result of 0.2 seems very reasonable but difficult to support given the limited information.

Population trends from the NEFSC annual surveys

Table 2. Results from the smooth skate demographic analysis (A_{mat} is age-at-maturity, M_{adult} is adult mortality, S_{egg} is egg survival, S_0 is first year survival, $r_{predicted}$ is the projected population growth rate, and Gen Time is generation time).

Survey data is extremely noisy and shows no evidence of a declining population since the mid 1990's (Figures 1 and 2).

The fall survey shows some evidence that population may have declined in the late 1960's but the values are highly variable and there is no evidence for either a declining or increasing abundance. A linear fit to log transformed values suggests the population has been stable (-0.007 yr^{-1}) since 1994 (Figure 1, C).

The spring survey appears to have a slightly greater catchability for smooth skate than the fall survey (mean of 0.57 versus 0.41 per tow for the entire time series, respectively) but values are also highly variable.

A log transformation of the spring indices indicates that the population was in decline until the early 1990's (Figure 2, B) with an apparent recovery occurring since around 1994. This would correspond to the timing of the Georges Bank closed areas.

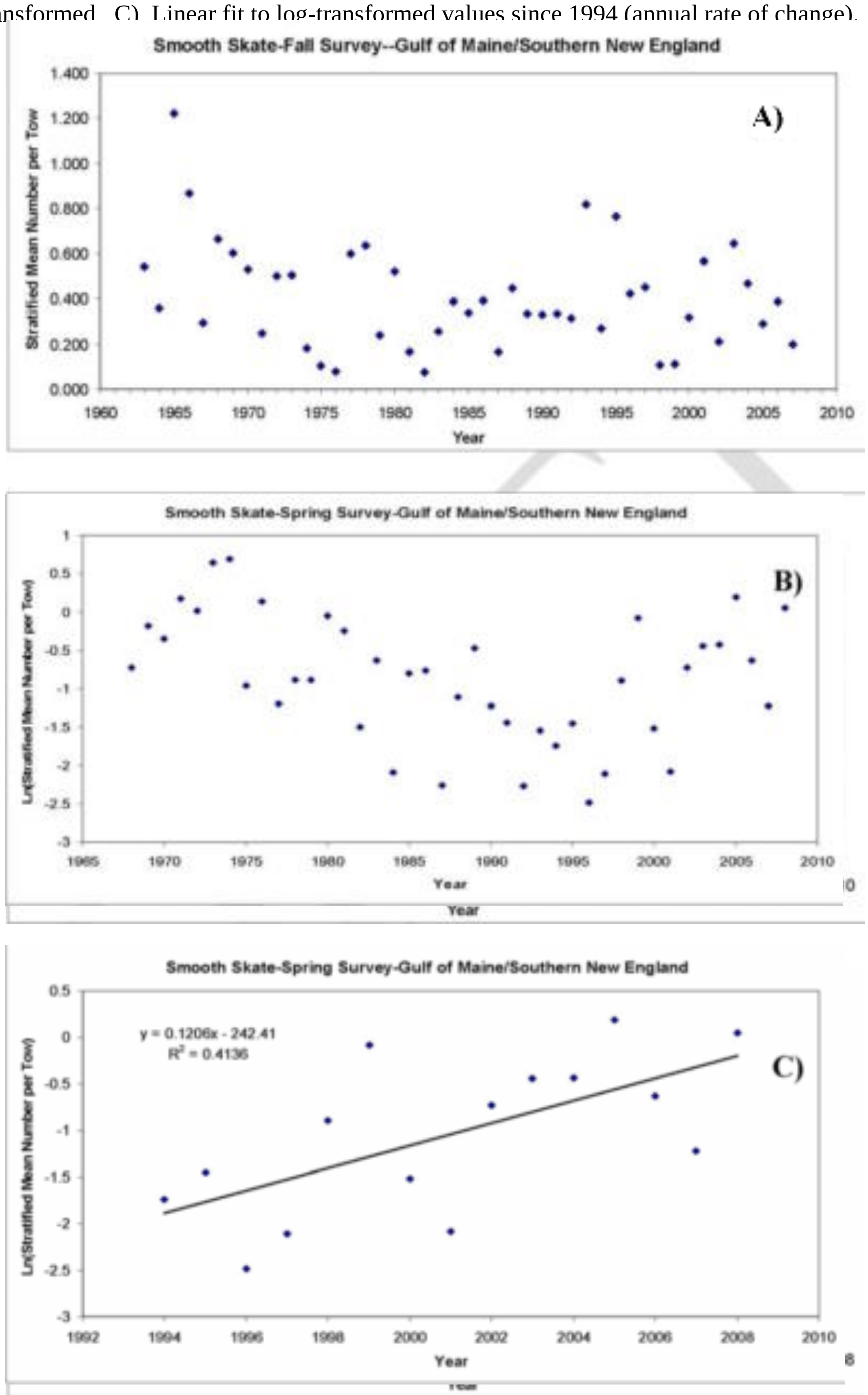
Since 1994, the spring survey data indicates that the population has been growing at a rate of around 0.12 yr^{-1} (Figure 2, C).

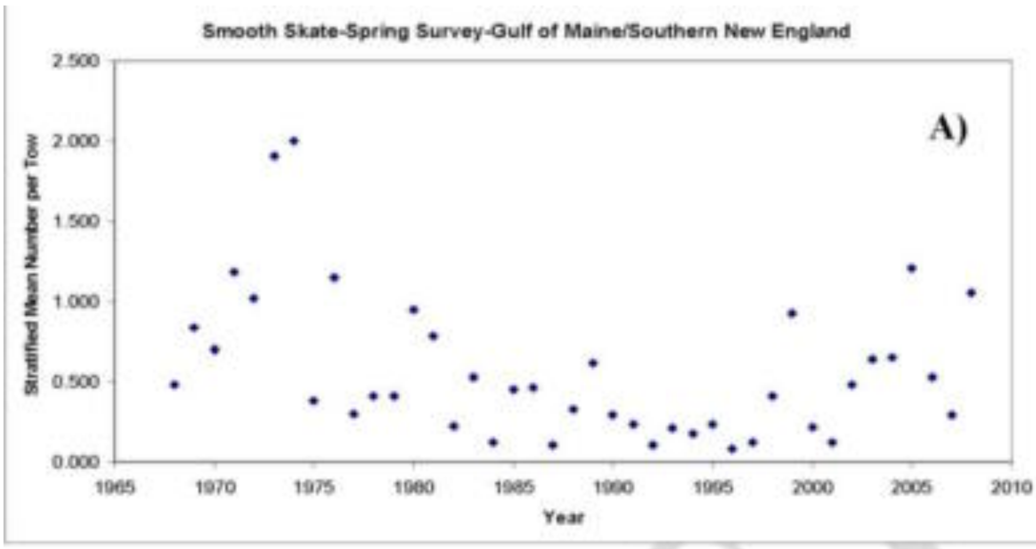
Results

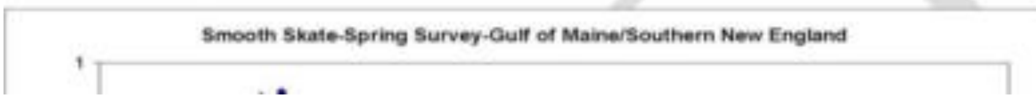
Amat	Longevity	Fecundity	M_{adult}	S_{adult}	S_{egg}	S_0	$r_{predicted}$	Gen Time	
9	25	20	0.17	0.844	0.525	0.844	0.199	13.137	
9	25	20	0.2	0.819	0.525	0.819	0.172	12.945	
9	25	20	0.15	0.861	0.525	0.861	0.218	13.275	
9	25	20	0.25	0.779	0.525	0.779	0.126	12.664	
9	25	20	0.17	0.844	0.250	0.844	0.140	13.441	
9	25	20	0.17	0.844	0.800	0.844	0.234	12.982	
9	25	20	0.17	0.844	0.525	0.600	0.172	13.272	
9	25	20	0.17	0.844	0.525	0.400	0.139	13.443	
9	25	30	0.17	0.844	0.525	0.844	0.233	12.988	
9	25	40	0.17	0.844	0.525	0.844	0.257	12.888	
8	25	20	0.17	0.844	0.525	0.844	0.233	12.026	
10	25	20	0.17	0.844	0.525	0.844	0.172	14.216	
10	25	20	0.25	0.779	0.250	0.400	-0.005	14.248	*1
8	25	40	0.15	0.861	0.800	0.861	0.355	11.752	*2

=Different from Base Case
*1 = Using Least productive parameters-not Possible
*2 = Using Most Productive Parameters--Upper Bound

Figure 1. Fall survey indices in terms: A) of stratified mean number per tow. B) Log-transformed. C) Linear fit to log-transformed values since 1994 (annual rate of change).




Smooth Skate-Spring Survey-Gulf of Maine/Southern New England
A)
Stratified Mean Number per Tow
2.500
2.000
1.500
1.000
0.500
0.000
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year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9. Document 9

An evaluation of survey distribution and observed skate CPUE to identify areas that could reduce skate mortality

Applegate 2007

MEMORANDUM

DATE: **July 30, 2007**

TO: Skate PDT

FROM: Andrew Applegate

SUBJECT: **An evaluation of survey distribution and observed skate CPUE to identify areas that could reduce skate mortality**

The Council approved two types of area based measures for Amendment 3 alternatives that would use time-area closures to reduce mortality on skate, particularly winter and thorny skates which the plan requires to be rebuilt. The Council included these measures in the Amendment 3 alternatives because, due to skate identification problems in the commercial fishery, they were the only measures that would effectively reduce mortality on any specific skate species (i.e. winter and thorny skate).

The PDT needs to determine how to evaluate these results to identify a range of options and specifications for each type of management measure. This might take the form of a range of areas encompassing different proportions of exploitable biomass (see below). It also may take the form of alternative area boundaries that may or may not be related to other current and potential fishery management actions.

One measure would use closed areas to discourage targeting of skates when and where the catches are highest, which in some ways reduces efficiency and the incentive to target skates. It also increases costs. This is similar to the rolling closure program that exists in the Multispecies FMP. It would be intended to apply to any vessel catching skates and prohibit possession in these areas unless fishing gear is properly stowed. Henceforth in this document, this measure will be referred as area based management, or ABM.

A second area based measure would be a gear restricted area, defined as an area within which specific gears would be prohibited due to their propensity to catch skates and contribute to skate mortality. Skate possession would be allowed within the area, but specific gear types would be prohibited for the duration of the closure. Exemptions might be permitted by the Council or Regional Administrator provided that modified gear reduced skate catch relative to other species below a pre-specified threshold.

Sources of data and analysis

There are two sources of information that may be used to analyze the potential effects of area based management on skate mortality, survey and sea sampling data (SSOP). Each has distinct advantages and disadvantages.

Annual resource surveys by NMFS vessels that commonly catch skates are conducted four times a year. Fall and spring trawl surveys have the longest time series and extend from NC to Canada and from the continental shelf edge to shore. A winter trawl survey has been conducted since 1992 on Georges Bank and the Mid-Atlantic regions, but not in the Gulf of Maine. A scallop dredge survey also catches skates, but skate catches have been recorded only since 2000.

The survey data has advantages arising from better species identification, a longer time series, standard gear performance, and statistically-based sampling. Catch weight per tow can represent the distribution of larger skates and may be a reasonable substitute for exploitable biomass. But it does not represent exploitable biomass unless a commercial selectivity ogive is applied (something that varies over time and fishing gear). Information about the proportion of biomass that would be discarded is also not known, as is information about vulnerability to commercial fishing in different areas.

Much like the analyses used to identify Essential Fish Habitat (EFH) in the Omnibus Amendment, survey CPUE can be averaged over the time series, classified by block (6' blocks, in this case), and ranked. The average CPUE divided by the total average CPUE represents the percent of total biomass expected to be in each block, since all blocks are the same size. Ordering the blocks by average CPUE gives a cumulative percent of total biomass. Unlike the habitat analysis which violated McCall's basin model to evaluate EFH (Applegate and Durbeck 2004), the analysis here is intended to emphasize locations where large catches occasionally occurred in the survey, areas and times where skate catches and bycatch would be high.

Sea sampling data are collected on commercial vessels, where information about kept and discarded skates is recorded on a tow by tow basis. Although sampling programs have statistical targets and there is an attempt to sampling by port, there is no statistical basis for sampling by area, like exists for random stratified sampling for survey data. Sampled tows however have a distribution that suggests relatively good geographic representation and concordance between the observed tows and reported fishing locations on VTRs (see Map 1). One shortcoming is that the SSOP data is influenced by management effects and therefore has no information about catch rates in closed areas, which might be re-opened for special access programs.

The SSOP data have three major advantages over the survey data, although skate species identification is somewhat suspect[1]. First, the data more accurately reflect the distribution of fishing effort and vulnerability of skates to that effort. Closures identified using these data therefore are very likely to affect fishing for skates. Second, the data also contain information about discarding and therefore estimates of potential catch reductions can incorporate estimates of discard mortality. This analysis assumes that 25% of discarded skates perish from commercial fishing. Finally, the SSOP data cover nearly all areas being fished, including those that fall outside of surveyed strata.

To analyze these alternatives using data from the SSOP, data from Jan. 1, 2004 to present were split into to classes and analyzed independently. The classes were split based on whether or not a tow or trip was intended to target any species of skate. Because observers are supposed to ask this question before the tow or trip occurs, the intended target sometimes differs from the actual catch composition, however. It is also probable that the target species is not related to the amount of skate catch, but rather the proportion of skate catch retained and landed. Nonetheless the amount of total catch is the important metric, as long as discard mortality is taken into account (the present analysis assumes a 25% discard mortality rate[2]).

The PDT chose to limit the analysis of observer data to these dates for two reasons. NMFS greatly increased sea sampling frequency in 2004 in response to concerns over limited knowledge and imprecise estimates of discards. In addition, skate identification training improved to help correct earlier problems, after the Skate FMP was adopted in 2003.

In both cases, the data were further classified by gear type (finfish trawls, sink gillnets, scallop dredges, and other miscellaneous gears) and by calendar quarter. The vast majority of incidental skate catch (landings and bycatch) was observed on trips using finfish trawls, gillnets, and dredges. The vast majority of skate catch (landings and bycatch) on trips targeting skates were by vessels using trawls and gillnets.

In both analyses, the observed skate catches were binned into 6 minute blocks (0.01 decimal degree square) and averaged for each data classification (gear and quarter). The cumulative ranking of the block's CPUE represented the amount of catch that would be affected by a potential closure, thereby representing the smallest set of blocks that would have the greatest potential reduction in catch, as a starting place for further work. Although the areas focus on reducing catches of winter and thorny skates, the amount of catch of other skate species that would be affected by a potential closure was also estimated. Observed hauls where there were no skate data were assumed to have zero skate catch, since the observers are instructed to record the hail weights of all species in the catch.

Assuming that a haul represented a constant unit of nominal effort and that catchability for a gear type was constant over all areas, the average CPUE was used to index exploitable biomass. Thus, cumulative CPUE would represent the amount of catch affected by a closure assuming that fishing effort was applied uniformly over the blocks where hauls were observed. An alternative and more accurate interpretation is that the cumulative CPUE represents the proportion of exploitable skate biomass that would be affected by the closure. Provided sufficient data on total effort exists, this analysis could be improved to account for the distribution of fishing effort and/or the

[1] Species identification by observers has improved, particularly since 2003. Around 25% of the observed skates in 2006 were however unidentified by species. SSOP program managers believe that when skate species are identified, they are accurate.

[2] The ranking of blocks with the highest total catch is not affected by the discard mortality rate, however.

sea sampling frequency in each block. Unfortunately, vessel trip reports are poorly suited for this type of analysis[3], particularly at this scale of resolution and vessel monitoring system data is neither sufficiently comprehensive nor studied to help.

Results – Winter skate

Survey data indicate that winter skate are most abundant on the northern half of Georges Bank and on the western edge of the Great South Channel during the fall survey (Map 2). During the spring and winter surveys, winter skate are more widely dispersed to the south into the Mid-Atlantic region, particularly along the shallower depths of Southern New England. During the spring, the skates appear more on the shallower parts of Georges Bank, but more along the southern half during the winter survey. Winter skate are caught in lower amounts on the summer dredge survey, particularly around the edge of Georges Bank and in the Great South Channel and Closed Area I. The scallop survey does not cover the central, shallower areas of Georges Bank, so the distribution in this map may be misleading.

When the cells are ordered by average winter skate weight per tow, and the cumulative sum is compared to the total index for all cells, CPUE thresholds were identified that represent vary proportions of total skate biomass (Figure 1). Specific CPUE thresholds associated with the top 15, 25, and 50% of total biomass are shown in Figure 2. For example, a block with an average catch exceeding 143.4 kg/tow would be in cells that represent the top 15% of total biomass as indexed by the survey CPUE, assuming all cells are the same size and the average is unbiased with respect to sample size.

A small proportion of cells contain the top 15, 25 or 50% of total biomass, representing the degree of concentration of winter skate in the various surveys. There are some similarities between this method and the Gini analysis performed by Sue Wigley several years ago to examine the relationship between geographical distributions of groundfish at various abundances. Out of 771 (six minute square) cells having tows with winter skate, only 9 would be needed to account for 15% of the total resource biomass. Nineteen cells would be needed to account for 25% and 64 cells for 50%.

Plotting these high CPUE cells on the survey distribution maps (Map 2) shows where the top 15, 25, and 50% of total biomass has been located during the survey time series. For the spring and fall surveys, cells with the highest biomass are located along the western edge of the Great South Channel, north of the Nantucket Lightship Area and west of Closed Area I, with a northwestern extension toward Cape Cod, MA. Also the area on the northern half of Georges Bank between Closed Areas I and II contribute to the highest proportion of total winter skate biomass. During the winter survey, cells with the highest proportion of total biomass are scattered through the Nantucket Lightship Area and to the northwest toward Southern New England. At the 50% level, an area running SW-NE within Closed Area II appears to be important.

Because various species of skates favor different depths and/or temperatures, the cells representing a given percentage of winter skate biomass contain lower proportions of total biomass of other skates. Areas considered for ABM would also affect the catches of other skate species as well. Within the 64 cells in the fall that contain 50% of the winter skate biomass were found 8.4% of little skate biomass, 5.6% of barndoor skate biomass, 0.5% of smooth skate biomass, 0.3% of thorny skate biomass, and 9.3% of all species combined (includes winter skate). All values for little, smooth, and thorny skates are shown in Figure 1. There appears to be more geographic overlap between winter and little skates in the survey than for other skates, most notably in the spring.

The following results describe the distribution of observed commercial (SSOP) CPUE in the directed and incidental skate fisheries, by gear and quarter. Similar to the treatment of the survey data above, the average skate catch per haul was ranked and plotted to show the distribution of the skate catch. Cumulative sums were calculated to identify the blocks where 15, 25, and 50% of the exploitable winter and thorny skate biomass would be included in a potential closure area[4]. If no effort redistribution occurred, the amount of catch reduction (assuming a 25% discard mortality rate) for each species was calculated over the range of cumulative catch of winter or thorny skate

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[3] The vast majority of trips report a single average latitude/longitude pair to represent the average fishing location for the trip. The actual distribution of fishing effort for the trip may be much different and has furthermore been shown to have a relatively high degree of error in the 2004-2006 groundfish trawl fishery.

[4] This of course assumes that the SSOP data are representative of the distribution of total fishing effort and that the average commercial CPUE in each cell indexes the amount of total biomass of winter skate within it.

to show what the effects might be on little, smooth, thorny, and winter skates. Of course effort shifts might actually increase mortality on species other than winter and thorny skates.

Blocks ranked by winter skate CPUE have different effects on mortality of various skates and on the amount of ex-vessel value affected by a potential closure. The effect of closing blocks ranked by winter skate CPUE on little, smooth, thorny, and winter skates is shown in Figure 5 to Figure 8 for fisheries catching skates while targeting other species (indirect skate catch) and Figure 9 and Figure 10 for the directed skate fishery. For the fishery targeting skates, the total value of all landed species on observed hauls targeting skates is included. For the fishery with incidental skate catch, the total value of all observed hauls (whether the trip targets skates or other species and whether or not the haul caught skates) was included.

The threshold CPUEs by gear and quarter were calculated for fisheries targeting skates and for those catching skates incidentally (whether or not skates were kept and landed). Cumulative winter skate exploitable biomass, cells ordered by winter skate CPUE are shown in Figure 5 to Figure 10, by gear and directivity. The charts also show the percent of total catch for little, smooth, and thorny skates that would be contained in cells at various winter skate CPUE. Differences between winter skate cumulative exploitable biomass and winter skate catch (mortality) reduction account for the amount of discard in each cell included and the assumed 25% discard mortality rate.

Including cells that account for 50% of the observed winter skate catch, for example, would account for about 35% of the winter skate mortality in the trawl fishery (Figure 5), and 20% of the smooth and little mortality, but only 7-8% of the landed value of all species (including winter and other skates)[5]. Other comparisons for trips fishing with gill nets, scallop dredges and miscellaneous gears can be made in the other graphs in Figure 6 to Figure 8.

Similar to the method used to analyze the survey data, Map 3 to Map 8. Show the distribution of cells containing 15, 25, and 50% of the exploitable biomass of winter skate by calendar quarter.

Incidental winter skate catches on trips using finfish trawls occurred mainly SW and E of the Nantucket Lightship Area (Map 3), SW of Closed Area II, along the northern edge of Georges Bank and on a couple of the ledges in the central Gulf of Maine, including Cashes Ledge. The highest gillnet catches occurred just west of the Nantucket Lightship Area. Incidental winter skate catch in the scallop dredge fishery were scattered through the Mid-Atlantic region and an area within the eastern part of Closed Area II. These distributions are consistent with the biomass distribution in the winter trawl survey (Map 2).

The distribution of incidental winter skate catches in quarter 2 (Map 4) were similar to those during quarter 1 (Map 3), but there were a few minor differences. The highest finfish trawl catches occurred in a little more shallower areas of Georges Bank than in quarter 1, consistent with the distribution observed in the spring survey (Map 2). Gillnet catches were highest a little more west of the Nantucket Lightship Area and also begin to appear east and SE of Cape Cod. Winter skate catch in the scallop dredge fishery was concentrated just SW of Closed Area II, but this may be an artifact of closed area management, since the groundfish closed areas have been closed during quarter 2.

Incidental winter skate catch CPUEs were highest for trips using finfish trawls in the center of Georges Bank, west of Closed Area I and on the western side of the Great South Channel during quarter 3 (Map 5). The highest gillnet catches also occurred on the western edge of the Great South Channel, east and southeast of Cape Cod, shifting from the area west of the Nantucket Lightship Area earlier in the year. It is not known whether these are the same vessels, or represent a different fishery. Incidental winter skate catch on scallop dredges were relatively low, but centered in the Great South Channel between Closed Area I and the Nantucket Lightship Area, as well as in the southern part of Closed Area II. These data are consistent with the distribution of winter skate in the fall survey (Map 2).

In quarter 4, the incidental winter skate catch distribution (Map 6) was similar to quarter 3, but the highest catches for vessels using trawls shifted a little further north on Georges Bank. The highest gillnet catches occurred again SE of Cape Cod, but also occurred in an area SW of Martha's Vineyard. The highest observed scallop catch

[5] The total value of observed landings was calculated as the product of the hail weight of each species and the 2007average price reported by dealers.

per tow occurred in Closed Area II again, but also west of the Cod HAPC and in the Great South Channel, west of Closed Area I. These distributions are more consistent with the winter skate biomass distribution in the fall survey (Map 2).

Trips targeting skates with finfish trawls and sink gillnets were observed during 2004 to present. The distribution of observed winter skate CPUE are plotted in Map 7 and Map 8.

Finfish trawl catches were highest in quarters 1 and 2 (Map 7) along the southern edge of Georges Bank and south of the Nantucket Lightship Area. High catches also occurred in an area NE of Closed Area I on the northern boundary of Georges Bank, particularly during quarter 1. During quarters 3 and 4 (Map 8), trawl fishing effort for winter skate was observed between Closed Areas I and 2, on the western side of the Great South Channel and near Block Island, NY, with the highest catch rates in the Great South Channel.

Observed, sink gillnet fishing effort focused on an area west of the Nantucket Lightship Area during quarter 1 (Map 7), but was scattered during quarter 2. Effort during quarters 3 and 4 (Map 8) was concentrated SE of Cape Cod, where the catch rates were the highest.

Conclusion (draft for PDT discussion)

Areas having high rates of bycatch and CPUE where winter skates are targeted can be identified from SSOP data. The areas vary by gear type and by season, following the distribution of winter skate in the four types of resource surveys. These data can be used to index exploitable biomass and to identify areas that are likely to protect a portion of the skate stock if the area is closed. A single area as a year around closure to all mobile bottom tending gear does not make sense given the seasonal changes in fishing activity and differences in areas targeted by fisheries using various gears, however.

For vessels using trawls, the analysis suggests that an area south of the Nantucket Lightship Area and along the southern boundary of Georges Bank might be a good area to consider for closure. During quarters three and four, this would shift to an area on the western side of the Great South Channel, north of the Nantucket Lightship Area and west of Closed Area I. For sink gillnets, a closure area might be considered immediately west of the Nantucket Lightship Area in quarters 1 and 2. In quarters 3 and 4, the area might shift to an areas along the Great South Channel between Closed Area I and Cape Cod. For the scallop dredge fishery, the area running NE-SW through the southern part of Closed Area II seems to be a hotspot for winter skate bycatch. Access programs in this area need to take into account and monitor winter skate bycatch, perhaps with a hard TAC to induce vessels to avoid areas within Closed Area II that have a high winter skate catch.

On the other hand, the distribution where winter skate is most abundant (Map 2) ranges from all of Georges Bank, the Great South Channel and inshore areas of Southern New England. Closure of an area to prevent targeting is likely to cause vessels to target skates elsewhere, or at another time of the year. An effort displacement model is needed to evaluate the effects and it may be that larger closures than suggested by this analysis would be needed to make meaningful reductions in skate mortality. Likewise, while bycatch hotspots can be identified, the effects on skates cannot be assessed without determining how vessels will respond, either by fishing for the same species elsewhere or by targeting a different species elsewhere.

More analysis would be needed to objectively identify contiguous areas with well defined boundaries, but given the concerns expressed here about the potential effects of effort shifts, it may be not worth the cost of doing a more intensive analysis. It may also be that no amount of modeling and analysis will satisfactorily predict the effects of a closure for a complicated multispecies fishery. Influences such as changes in price and restrictions for DAS use to target other species can have a larger effect on where vessels fish and what they target.

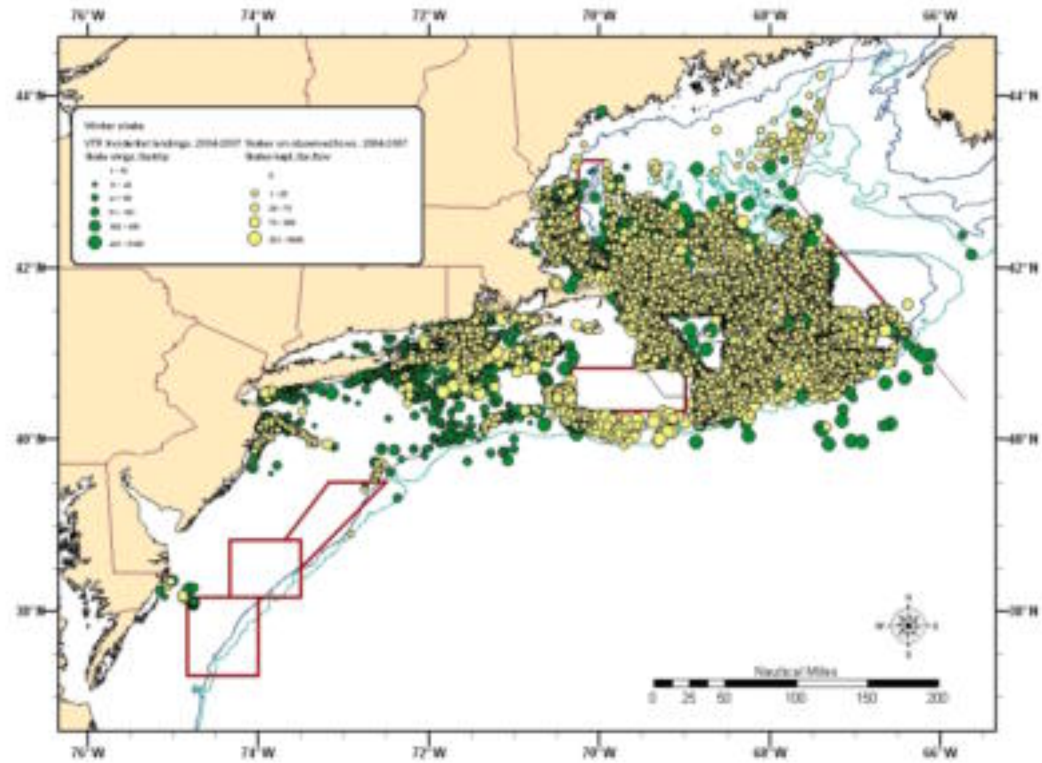
At this time, no additional analyses were performed to assess the potential shift of effort into other areas where skates and other species occur, nor was an attempt made to ‘square off’ or group the blocks into a few contiguous areas. Analyzing effort shifts into other areas or onto other species and effort reductions caused by an area closure would require a sophisticated model similar to the one used to evaluate groundfish closures. Grouping the blocks into contiguous areas might be done in an ad hoc committee approach that evaluates the results presented here, or through a more quantitative approach using objective functions, like MARXAN. The data treatment for the present analysis might be used as inputs to further analysis by a MARXAN model.

Literature cited

Applegate, Andrew J. and Edward Durbeck. 2004. A GIS-based spatial analysis framework for developing habitat closure alternatives in New England, U.S.A. IN: GIS/Spatial Analyses in Fishery and Aquatic Sciences (Vol 2). Fishery-Aquatic GIS Research Group, Saitama, Japan. pp. 355-380

Map 1. Distribution of kept skates on vessel trip reports (VTR, green) and observed commercial tows by vessels using finfish trawls during 2004 to 2007.

Skates incidental



Skates targeted

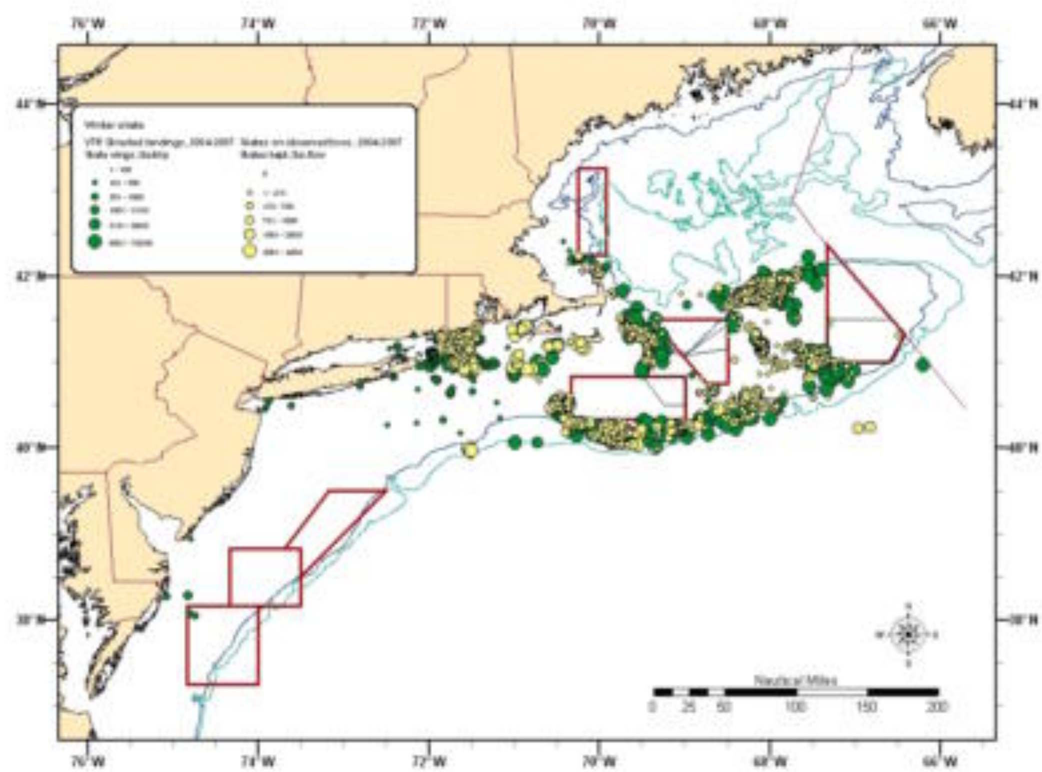
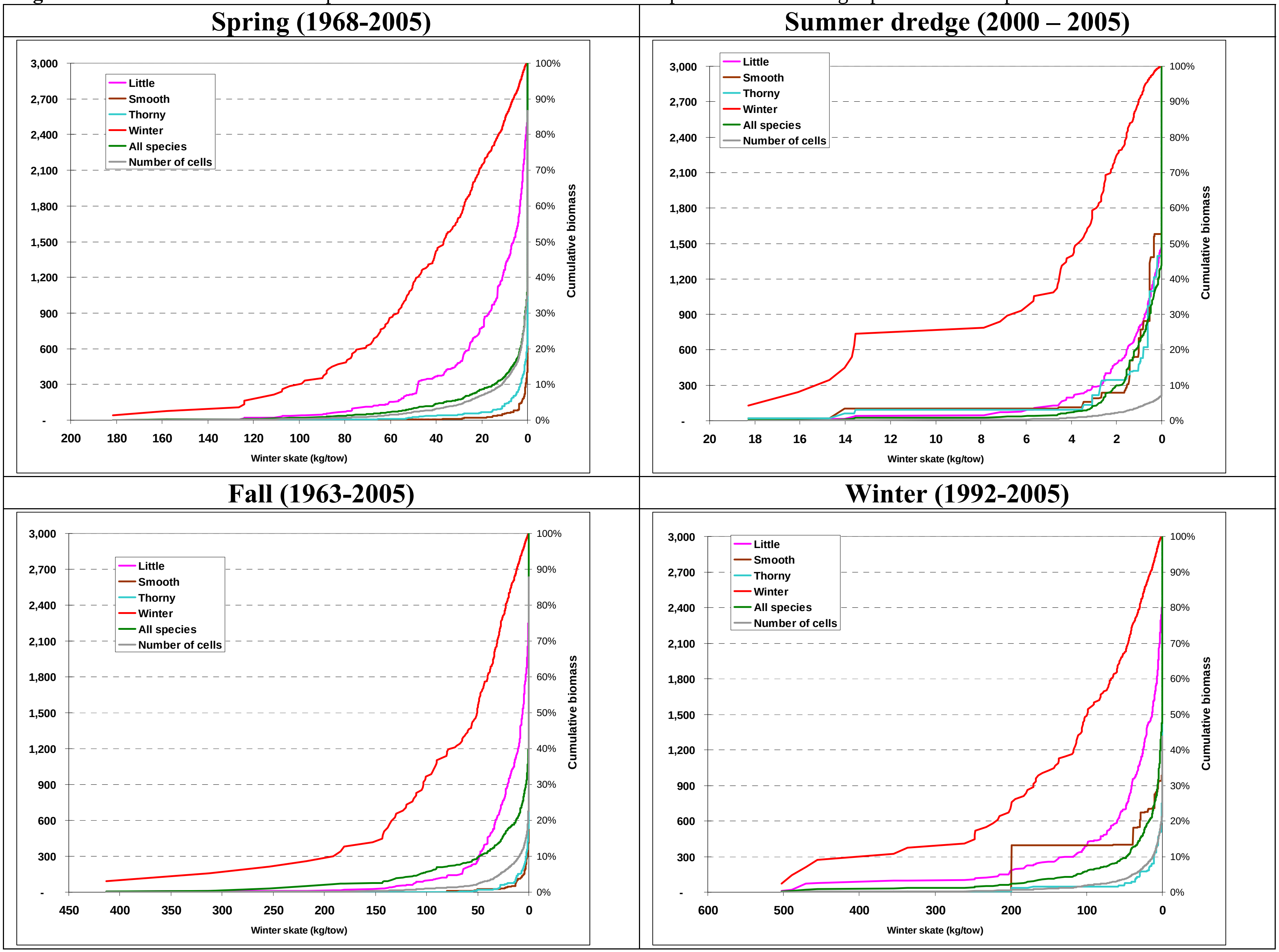
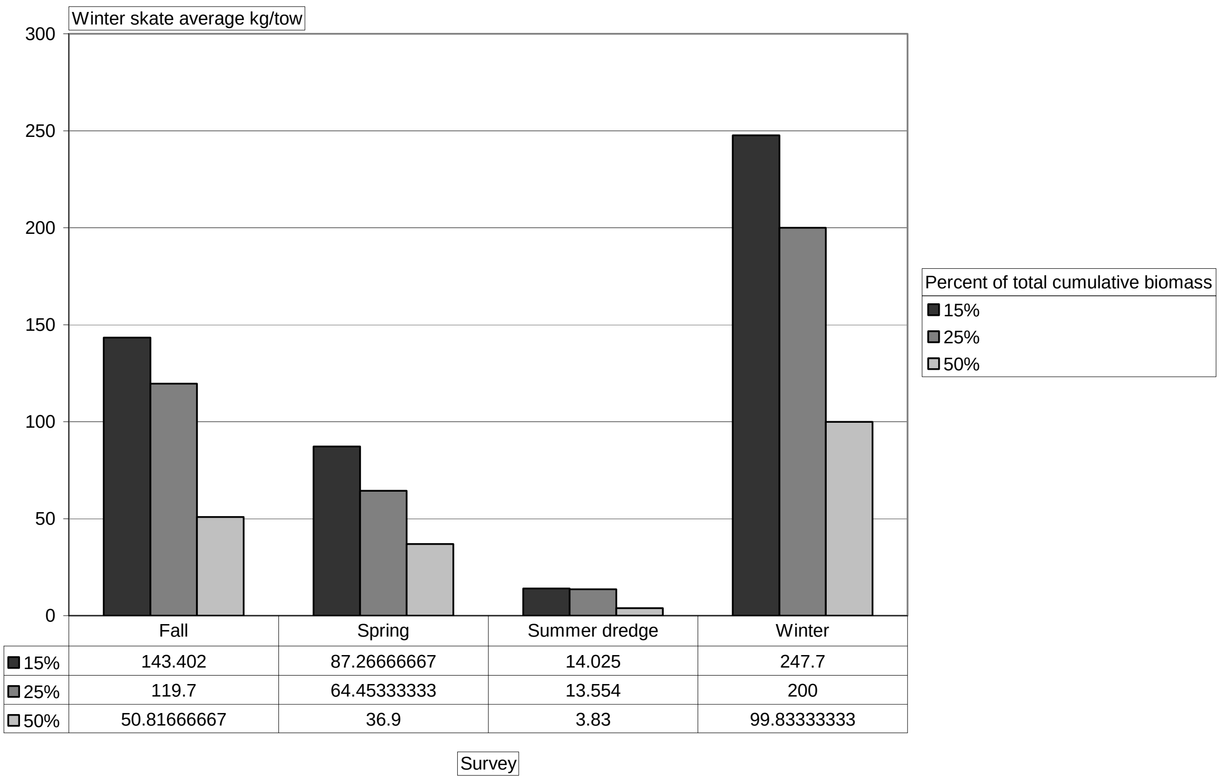


Figure 1. Ranked cumulative catch per tow for winter skate vs. other skate species and total weight per tow for all species.

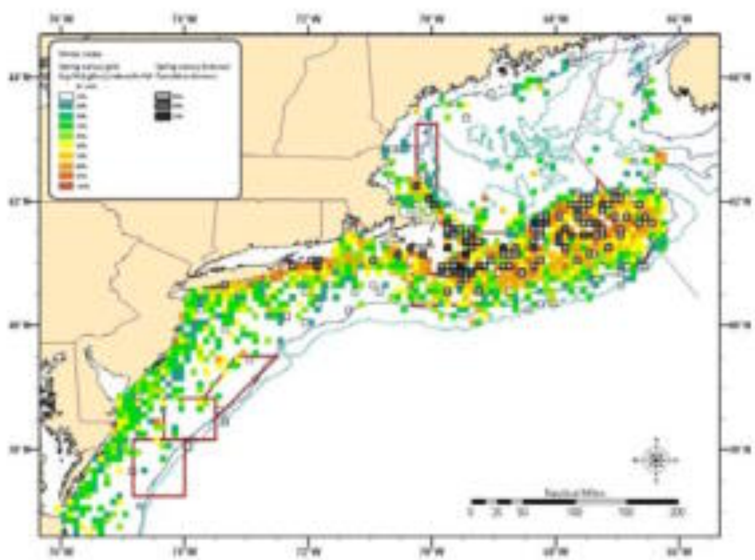
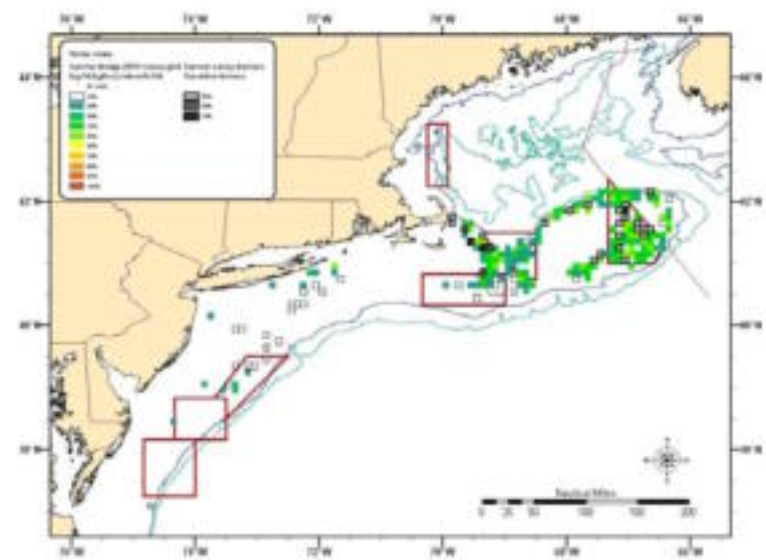
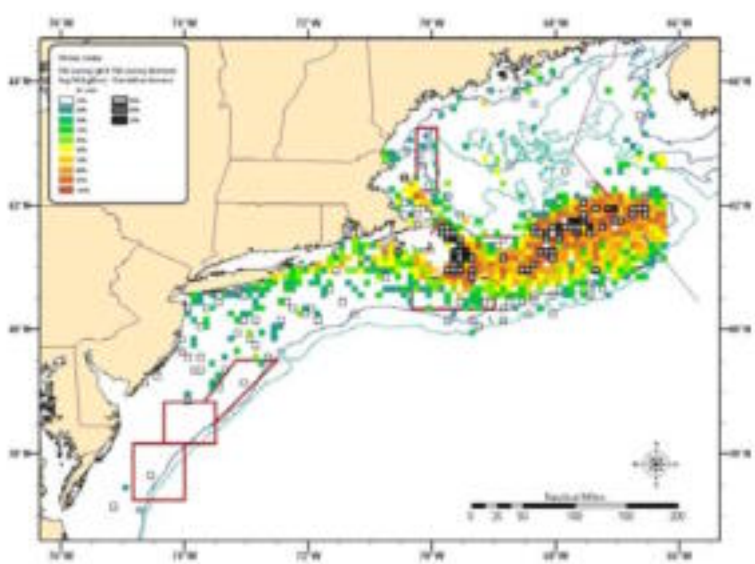
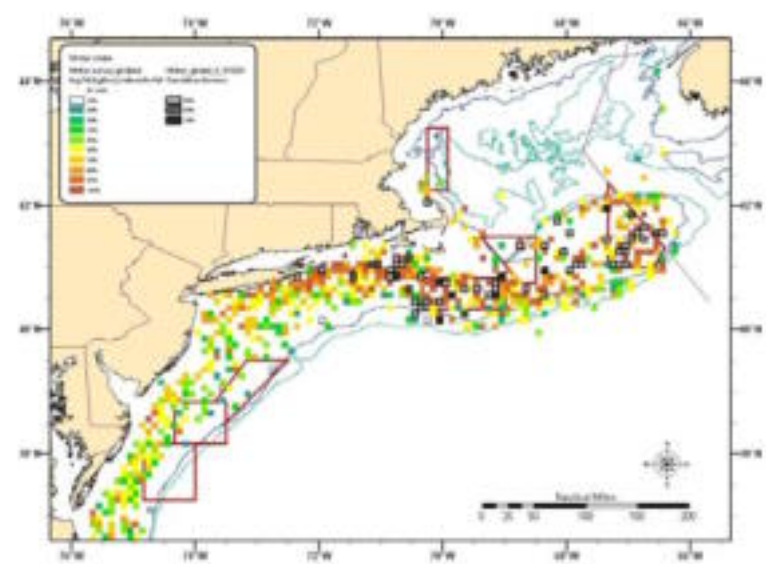


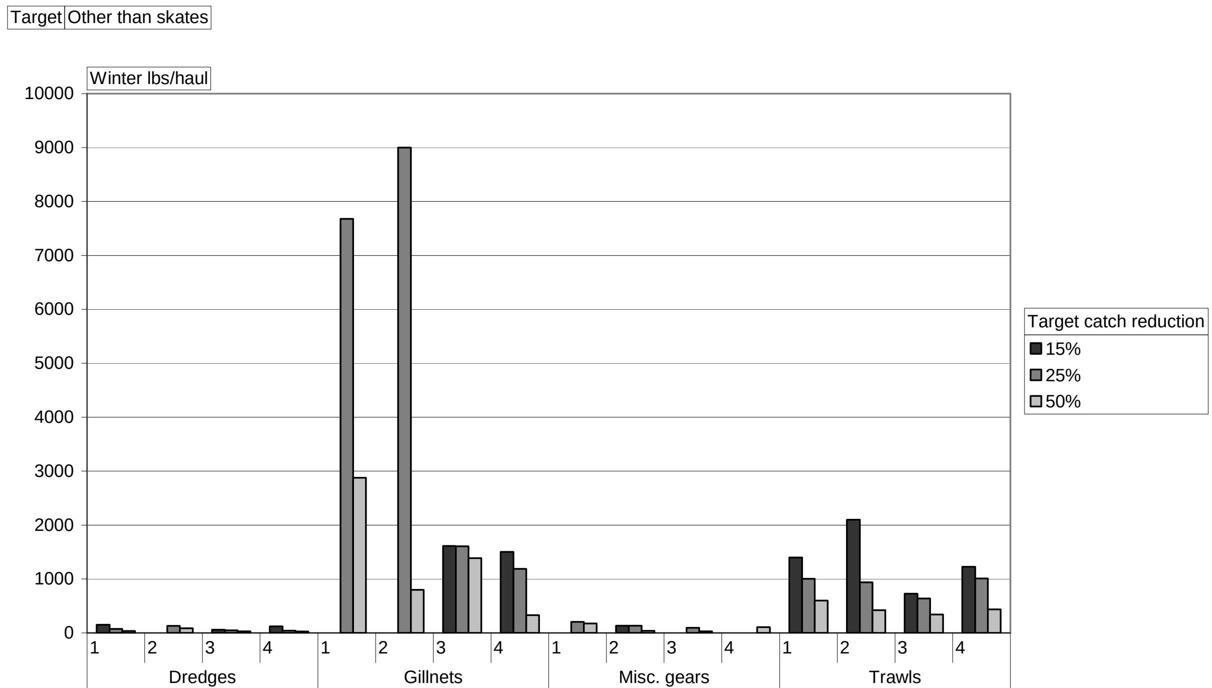


	Fall	Spring	Summer dredge	Winter
15%	143.402	87.26666667	14.025	247.7
25%	119.7	64.45333333	13.554	200
50%	50.81666667	36.9	3.83	99.83333333

Figure 2. Winter skate CPUE vs. ranked percent of cumulative winter skate biomass by survey.

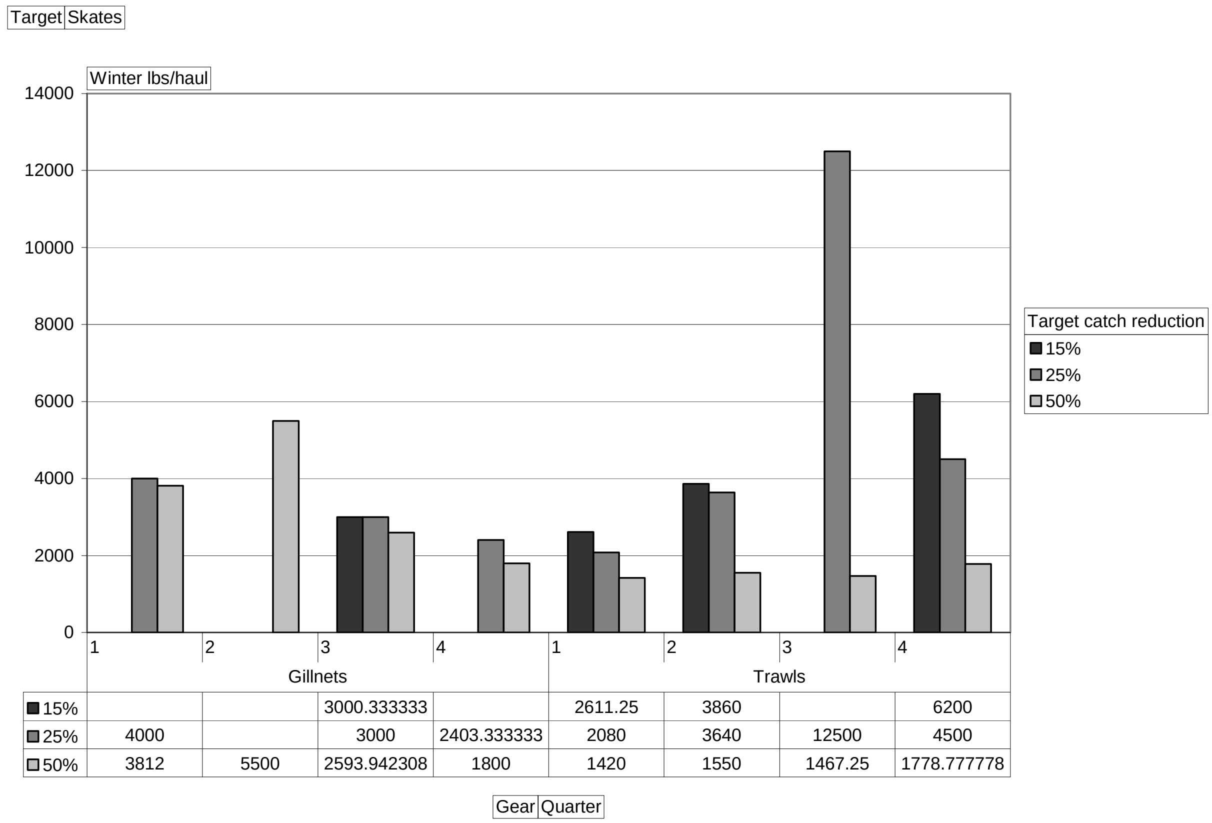
Map 2. Distribution of average survey weight per tow binned into 6 minute squares (color), vs. cumulative total biomass (gray shade).

Spring (1968-2005)	Summer dredge (2000 – 2005)
	
Fall (1963-2005)	**Winter (1992-2005)**
	



	Dredges 1	Dredges 2	Dredges 3	Dredges 4	Gillnets 1	Gillnets 2	Gillnets 3	Gillnets 4	Misc. gears 1	Misc. gears 2	Misc. gears 3	Misc. gears 4	Trawls 1	Trawls 2	Trawls 3	Trawls 4
15%	150		58	121.7			1614	1504		134.5			1398	2100	728	1227
25%	75	131.7	48	45	7680	9000	1605	1189	207	134.5	97.32		1008	939.4	638.3	1010
50%	35	88.89	33.69	29.14	2877	800	1386	331.3	176.7	40	33.33	108.2	600	420.8	341.5	438

Figure 3. Winter skate CPUE vs. ranked percent of cumulative winter skate exploitable biomass by fishing gear and calendar quarter for trips that do not target skates.



	Gillnets 1	Gillnets 2	Gillnets 3	Gillnets 4	Trawls 1	Trawls 2	Trawls 3	Trawls 4
15%			3000.333333		2611.25	3860		6200
25%	4000		3000	2403.333333	2080	3640	12500	4500
50%	3812	5500	2593.942308	1800	1420	1550	1467.25	1778.777778

Figure 4. Winter skate CPUE vs. ranked percent of cumulative winter skate exploitable biomass by fishing gear and calendar quarter for trips that target skates.

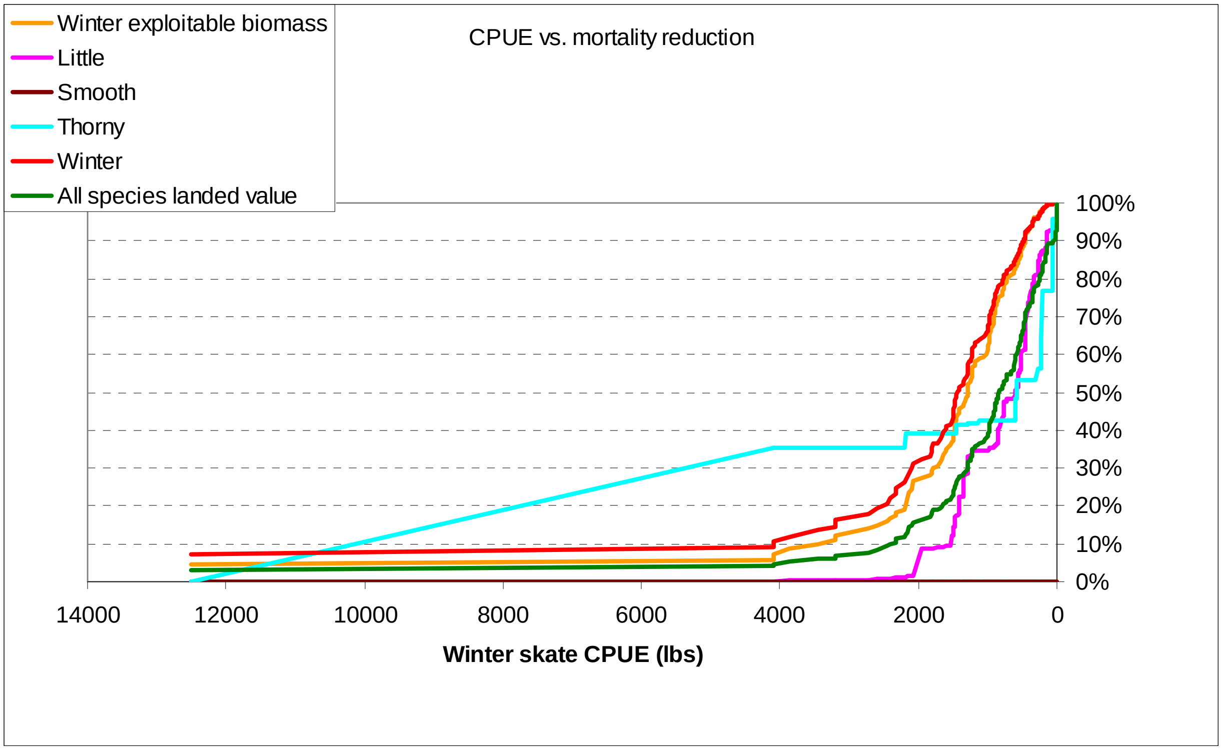


Figure 5. Incidental skate catch by vessels using finfish trawls: Percent of total exploitable biomass in blocks in descending order of winter skate.

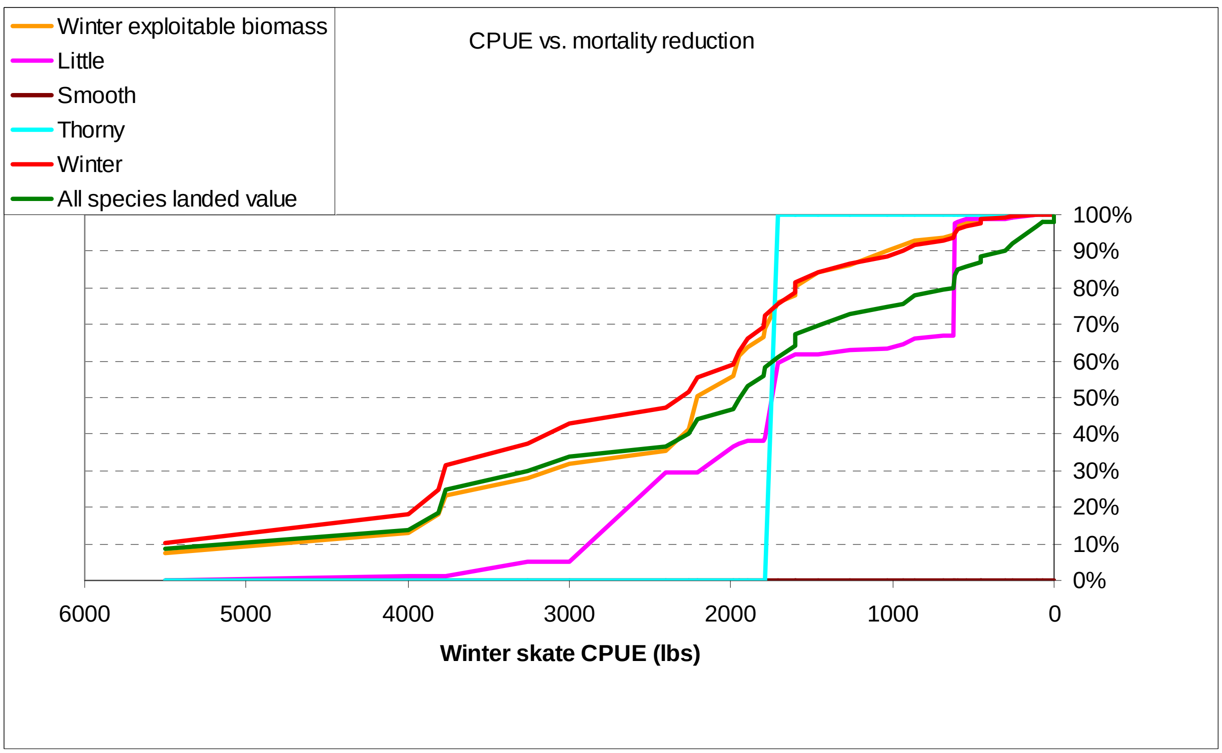


Figure 6. Incidental skate catch by vessels using sink gillnets: Percent of total exploitable biomass in blocks in descending order of winter skate.

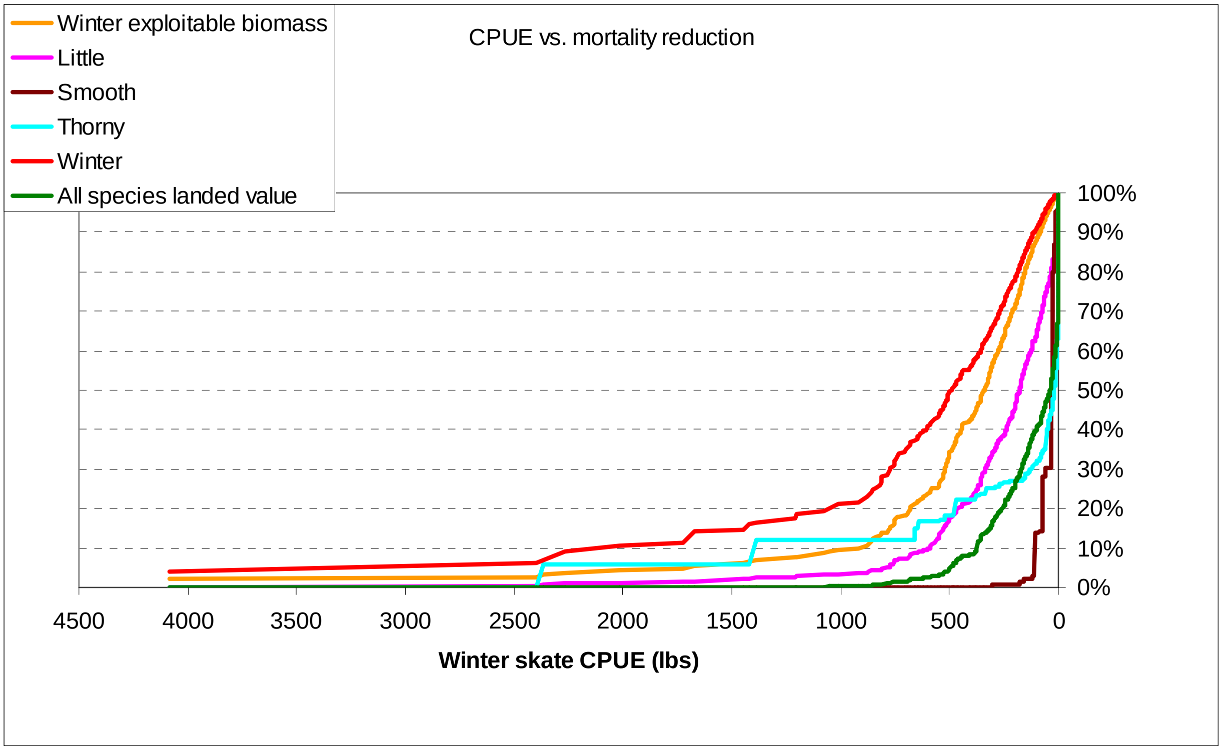


Figure 7. Incidental skate catch by vessels using scallop dredges: Percent of total exploitable biomass in blocks in descending order of winter skate.

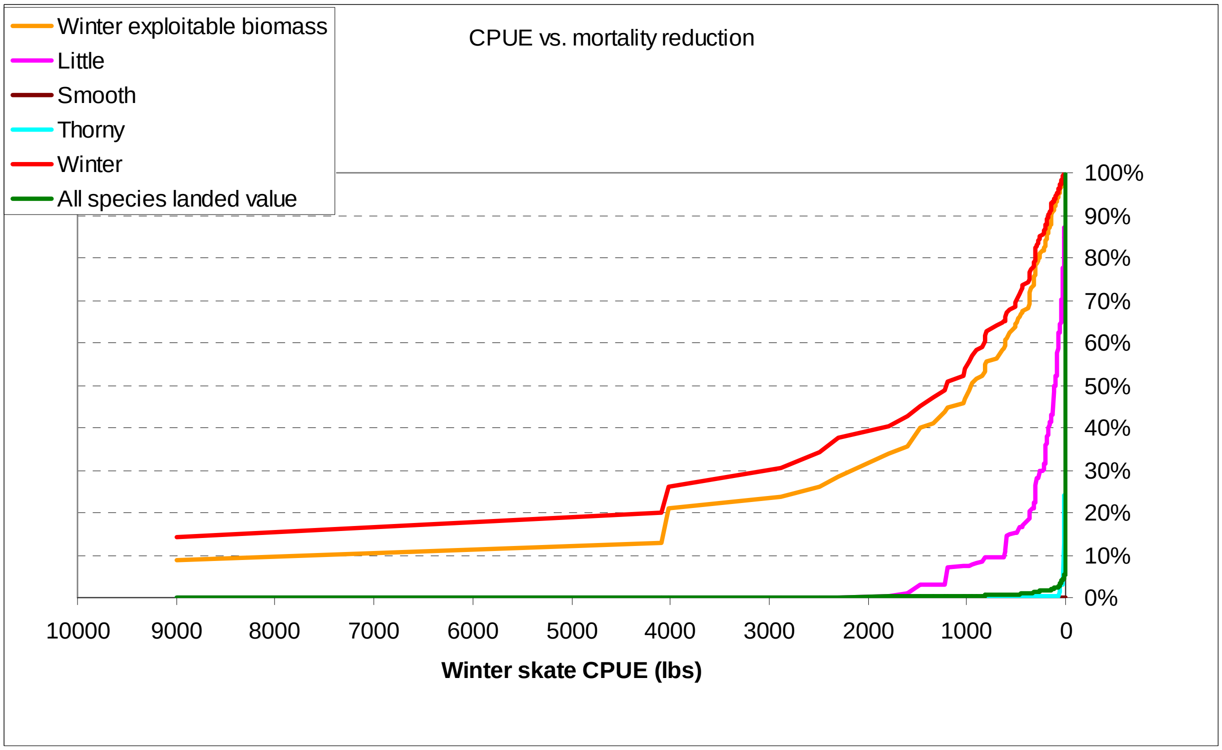


Figure 8. Incidental skate catch by vessels using miscellaneous gears: Percent of total exploitable biomass in blocks in descending order of winter skate.

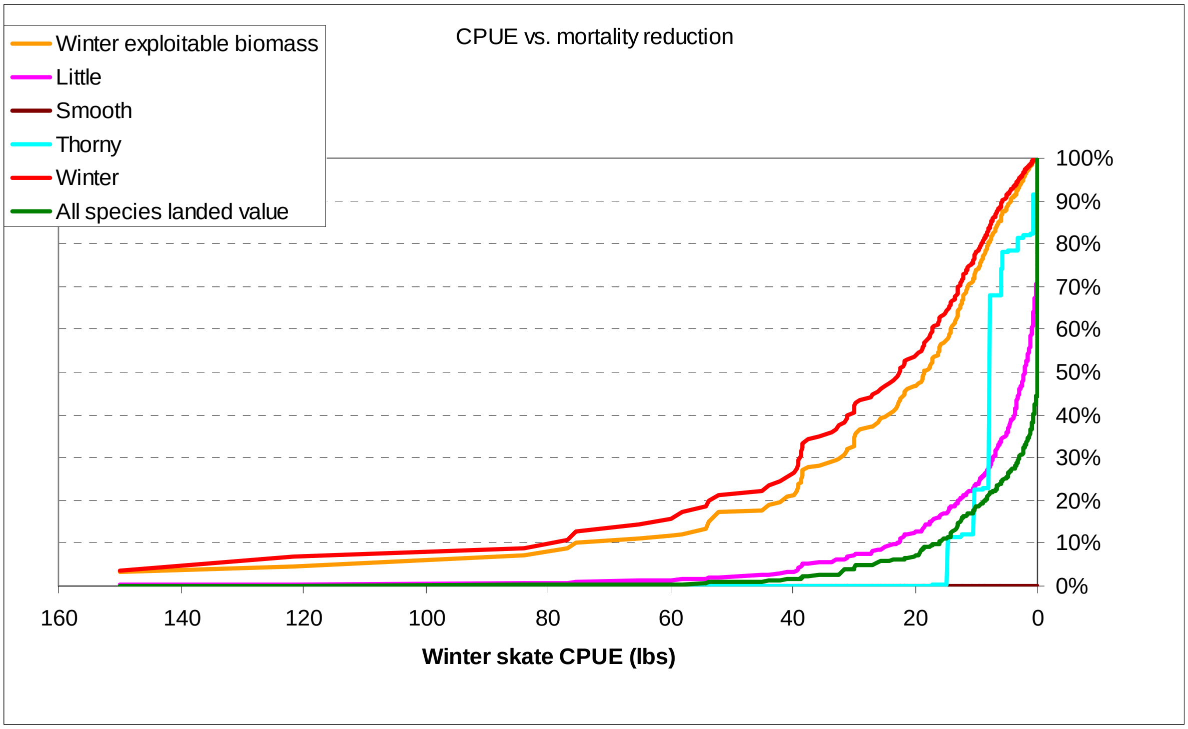


Figure 9. Targeted skate catch by vessels using finfish trawls: Percent of total exploitable biomass in blocks in descending order of winter skate.

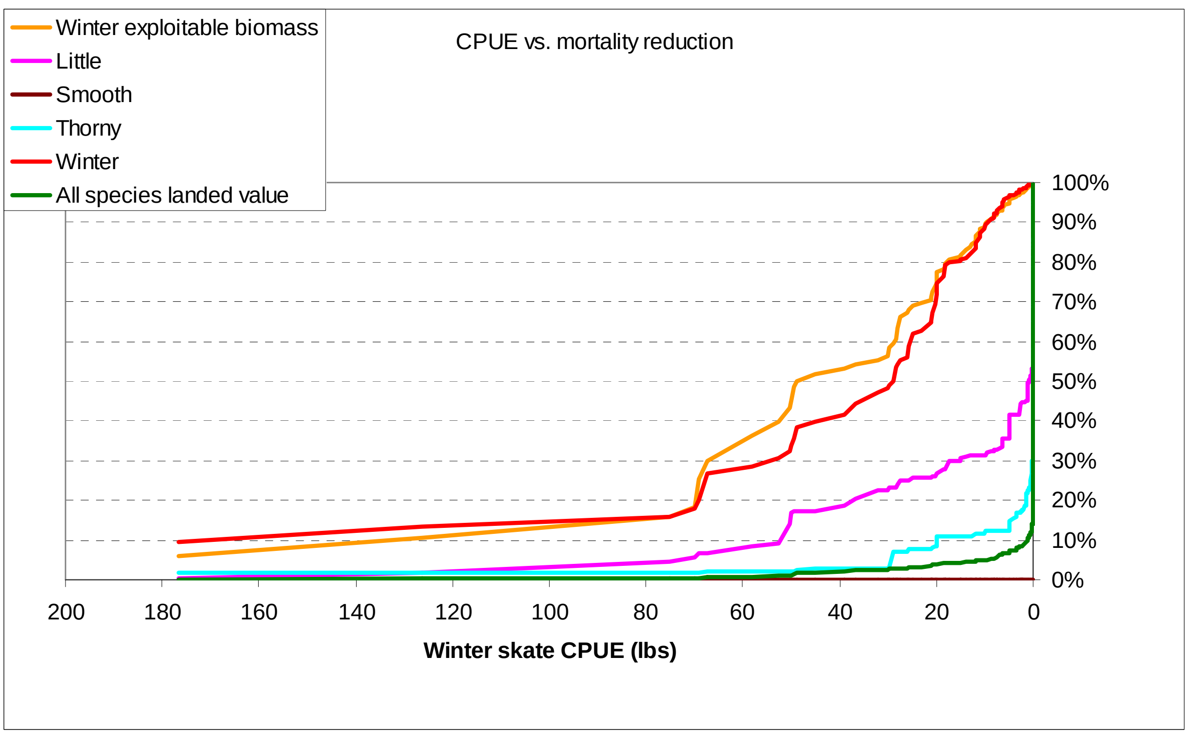
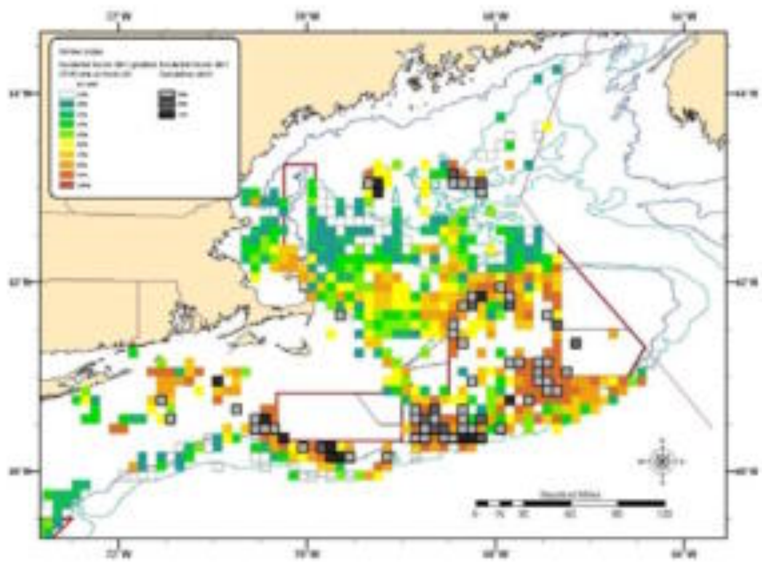
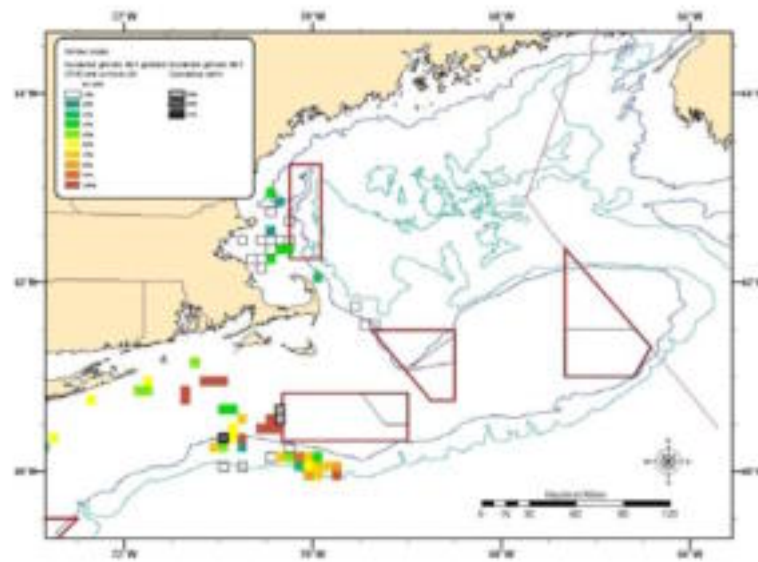
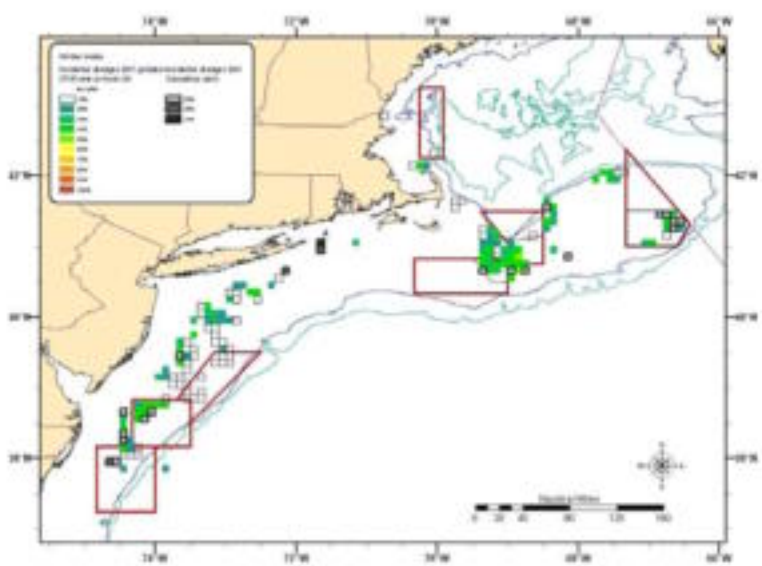
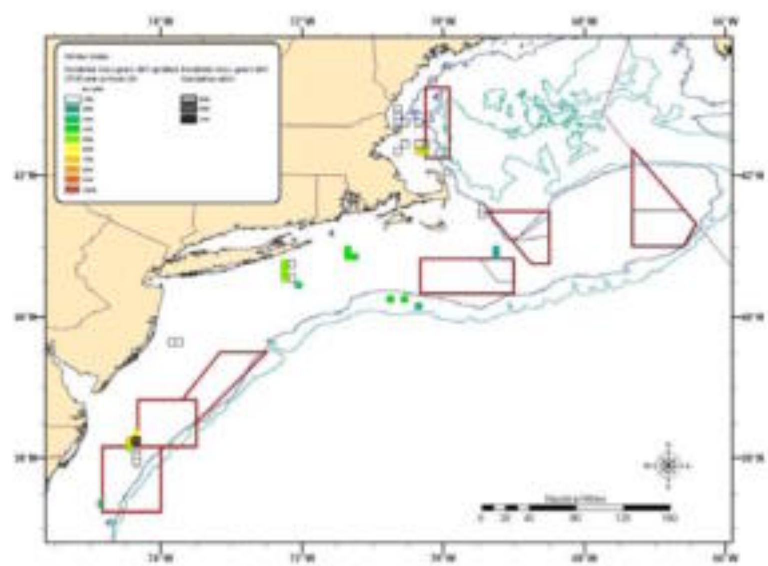
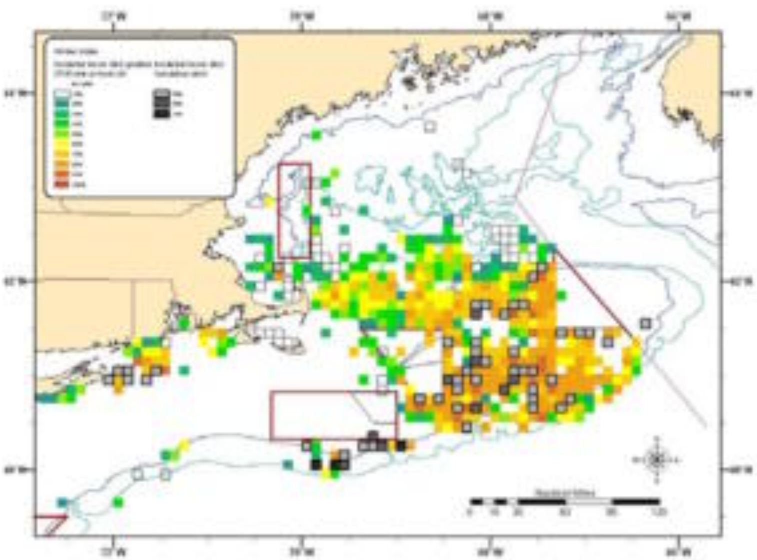
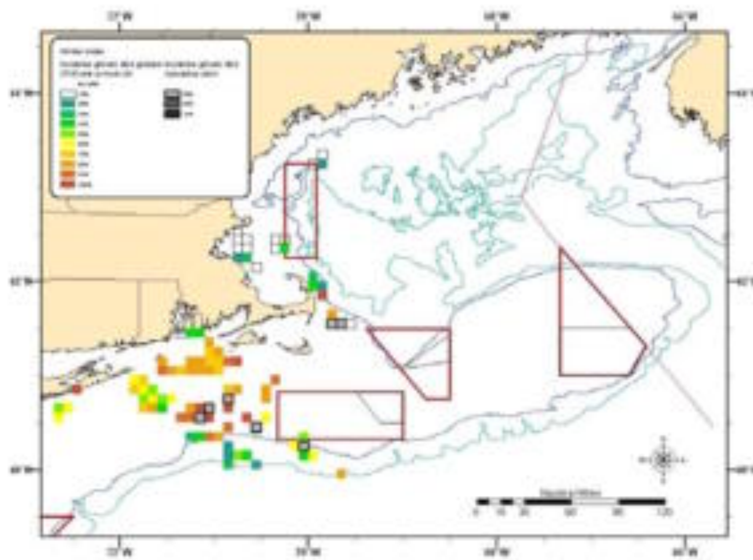
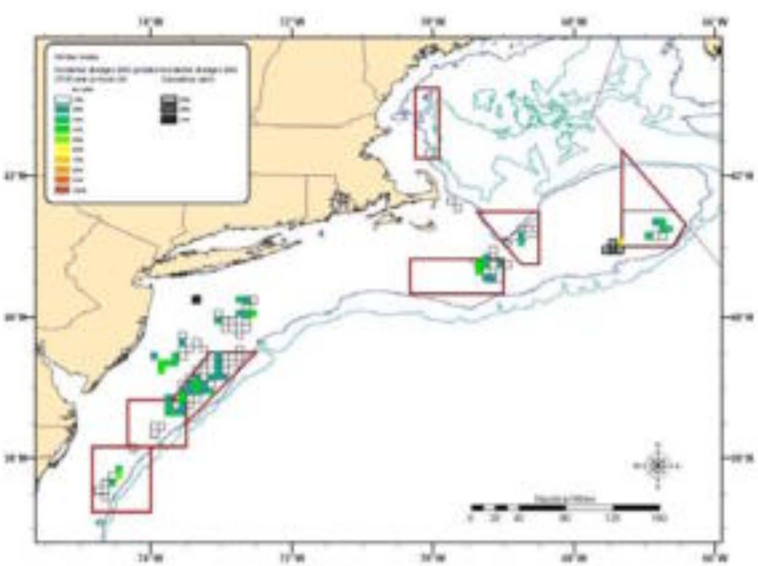
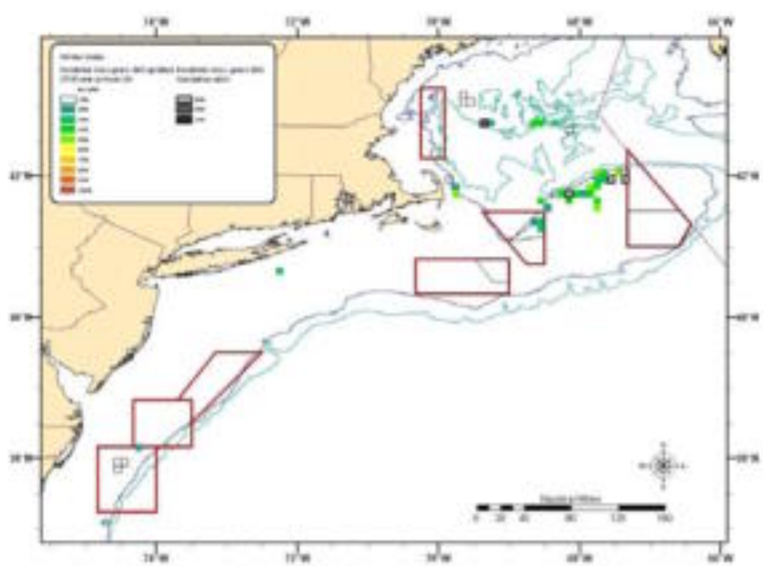


Figure 10. Targeted skate catch by vessels using sink gillnets: Percent of total exploitable biomass in blocks in descending order of winter skate**.**

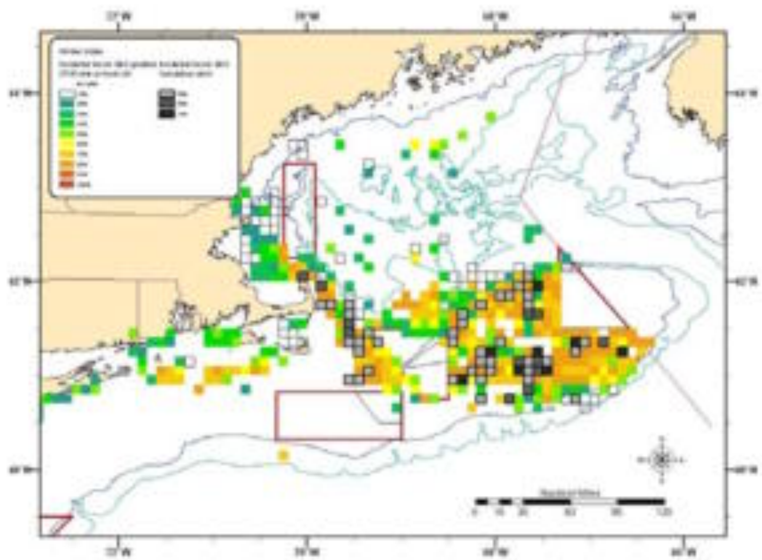
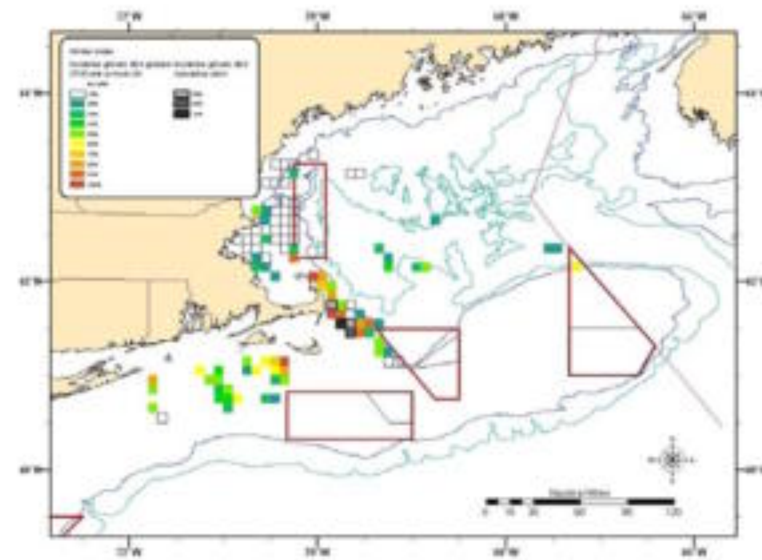
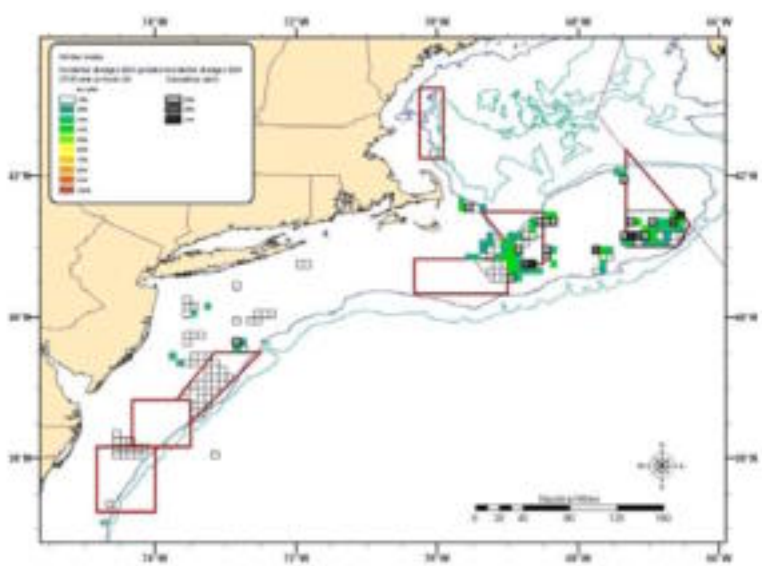
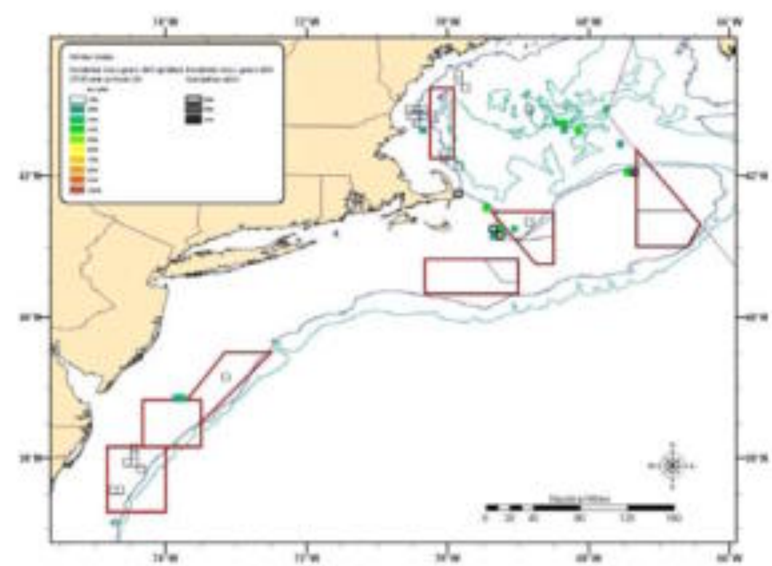
Map 3. Incidental winter skate catch distribution by gear type for observed trips during **quarter 1**, scaled to the average CPUE for trawls in quarter 1.

Finfish trawls	**Sink gillnets**
	
Scallop dredges	**Misc. gears**
	

Map 4. Incidental winter skate catch distribution by gear type for observed trips during **quarter 2,** scaled to the average CPUE for trawls in quarter 1.

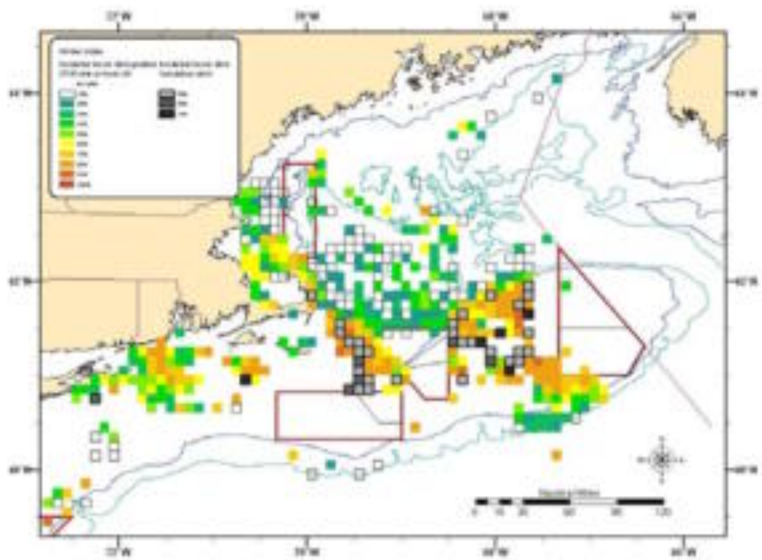
Finfish trawls	Sink gillnets
	
Scallop dredges	**Misc. gears**
	

Map 5. Incidental winter skate catch distribution by gear type for observed trips during **quarter 3,** scaled to the average CPUE for trawls in quarter 1.

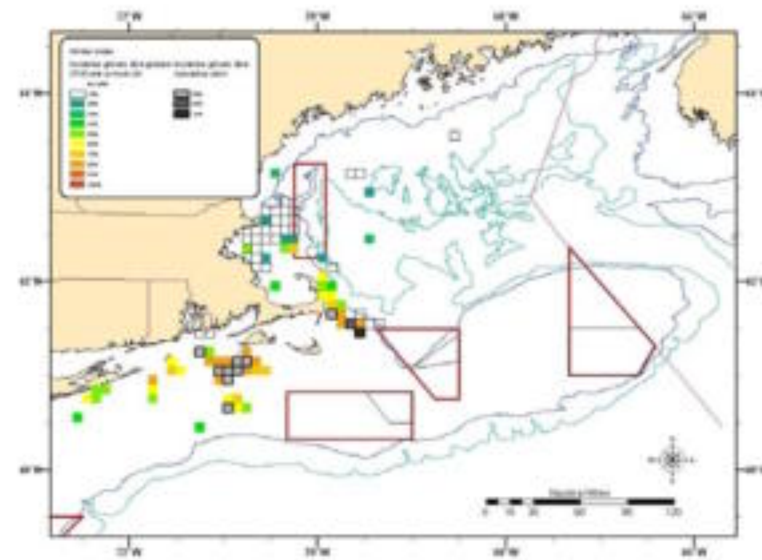
Finfish trawls	**Sink gillnets**
	
Scallop dredges	**Misc. gears**
	

Map 6. Incidental winter skate catch distribution by gear type for observed trips during **quarter 4,** scaled to the average CPUE for trawls in quarter 1.

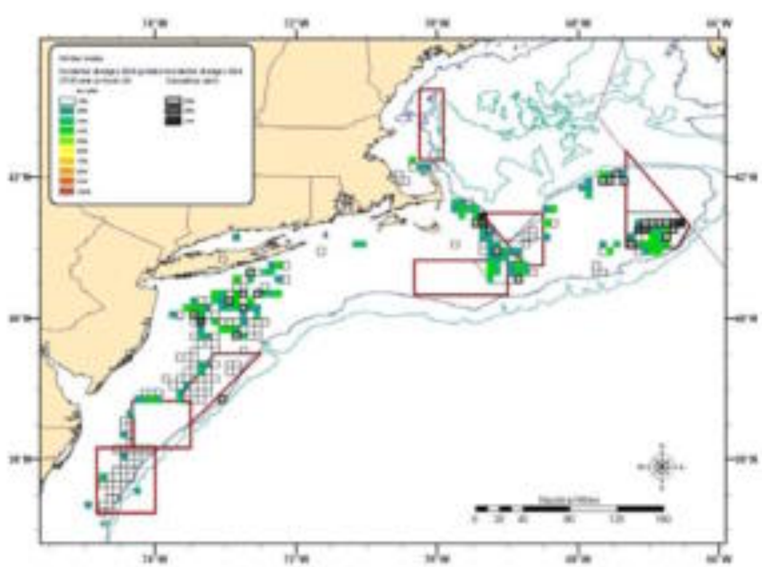
Finfish trawls



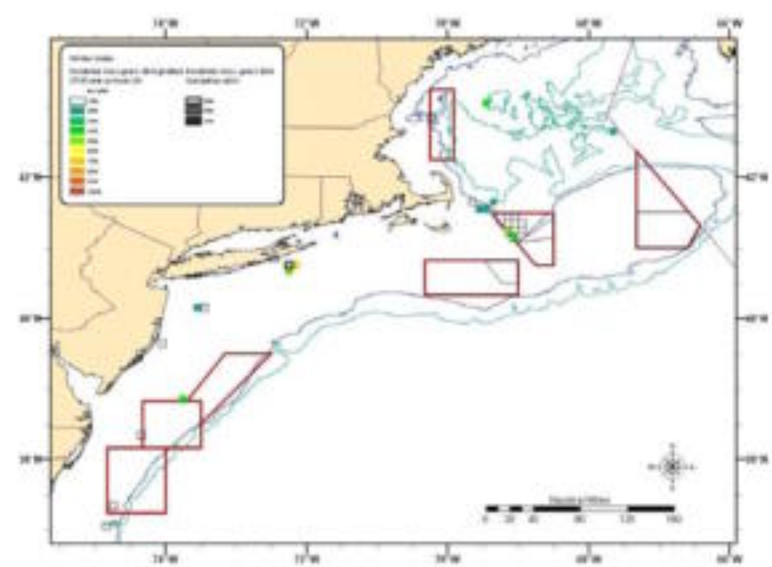
Sink gillnets



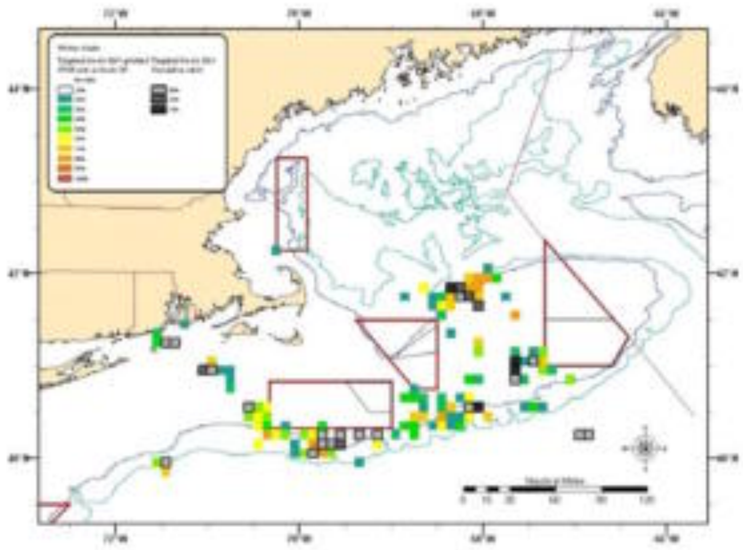
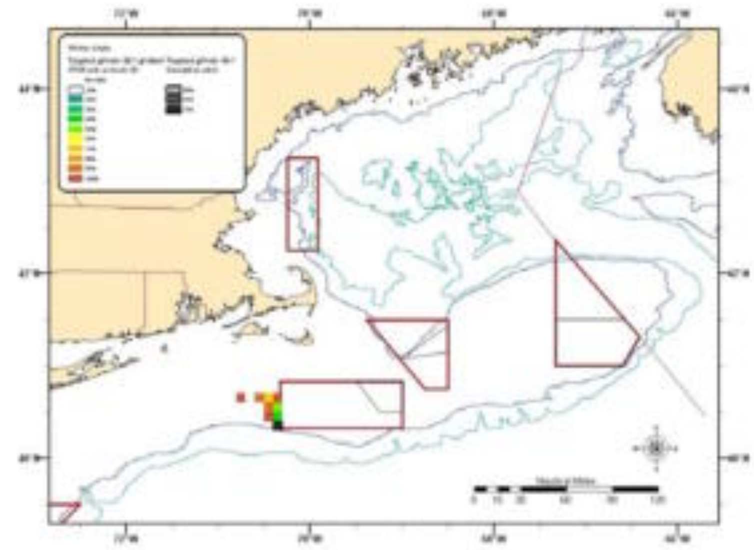
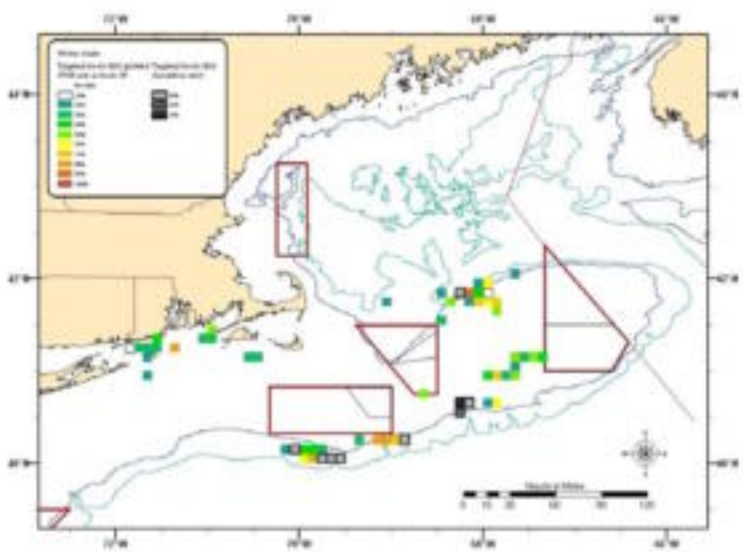
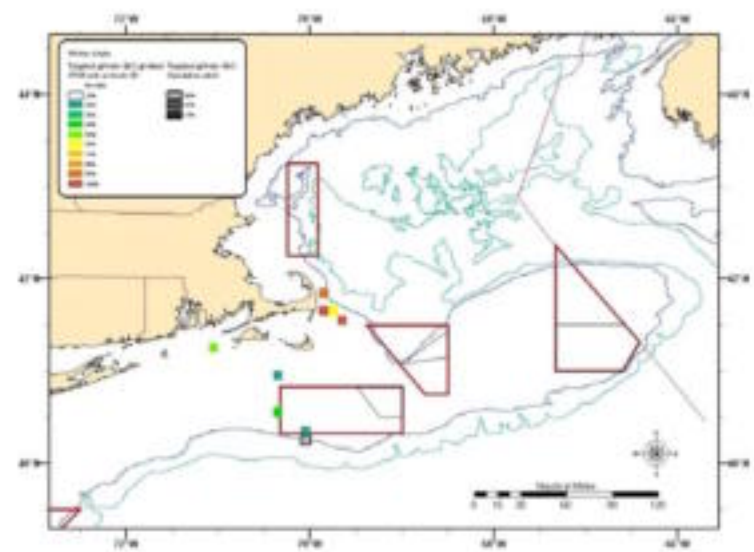
Scallop dredges



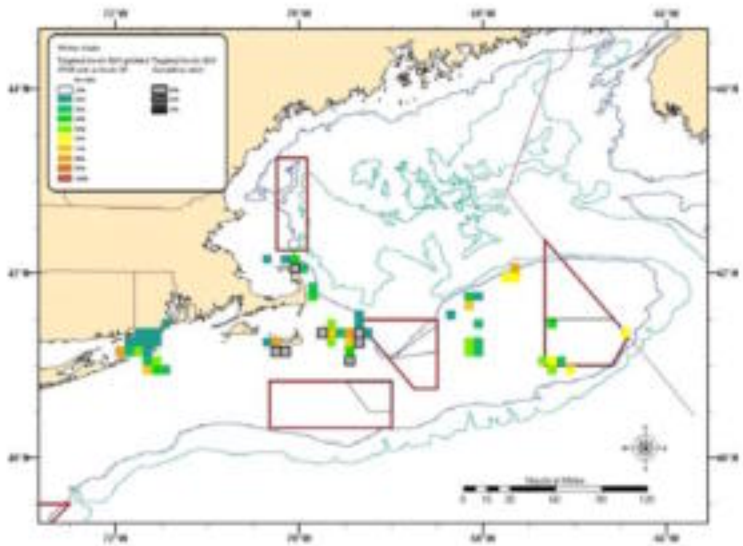
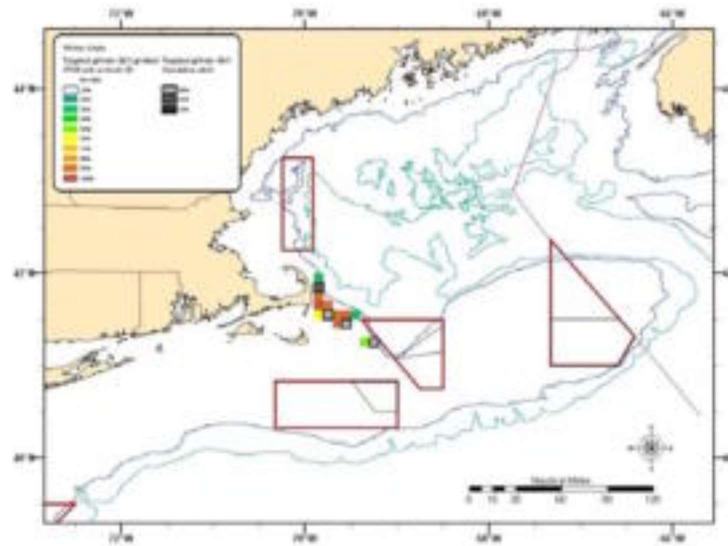
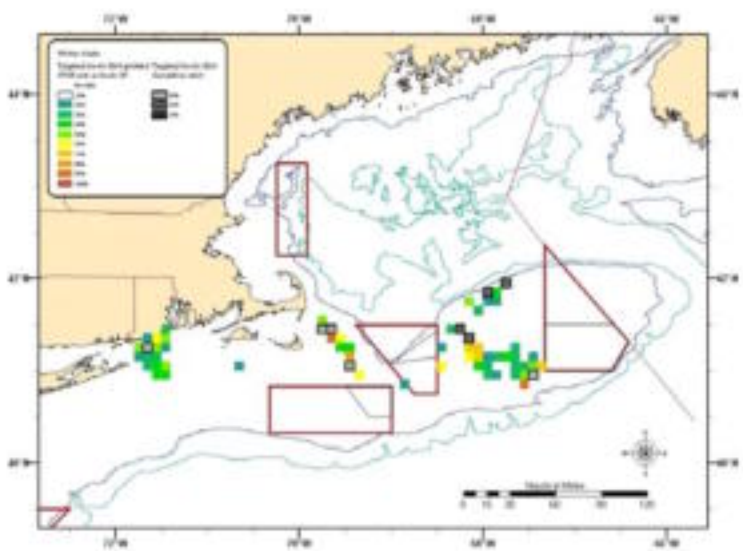
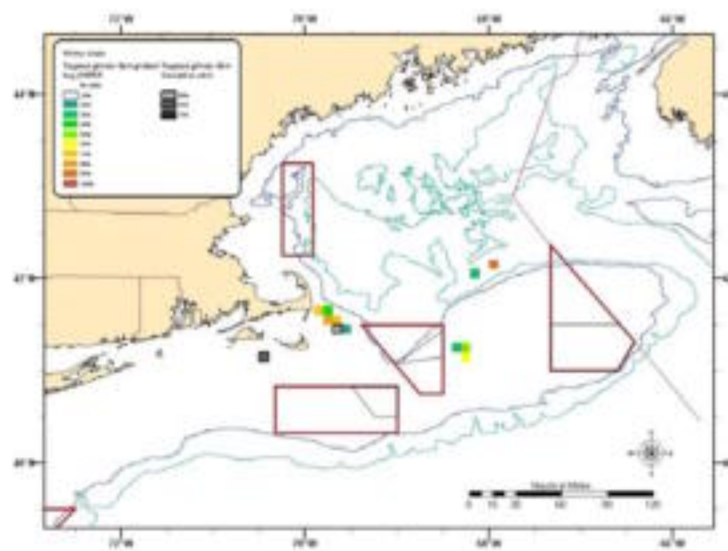
Misc. gears



Map 7. Targeted (directed) winter skate catch distribution by gear type for observed trips during **quarter 1 (upper) and quarter 2 (lower),** scaled to the average CPUE for trawls in quarter 1.

Finfish trawls (qtr 1)	Sink gillnets (qtr 1)
	
Finfish trawls (qtr 2)	**Sink gillnets (qtr 2)**
	

Map 8. Targeted (directed) winter skate catch distribution by gear type for observed trips during **quarter 3 (upper) and quarter 4 (lower),** scaled to the average CPUE for trawls in quarter 1.

Finfish trawls (qtr 3)	Sink gillnets (qtr 3)
	
Finfish trawls (qtr 4)	**Sink gillnets (qtr 4)**
	

10. Document 10

Two-bin model analysis of gear restricted and closed skate areas

Applegate 2007

New England Fishery Management Council
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John Pappalardo, *Chairman* | Paul J. Howard, *Executive Director*

MEMORANDUM

DATE: **December 5, 2007**

TO: Skate PDT

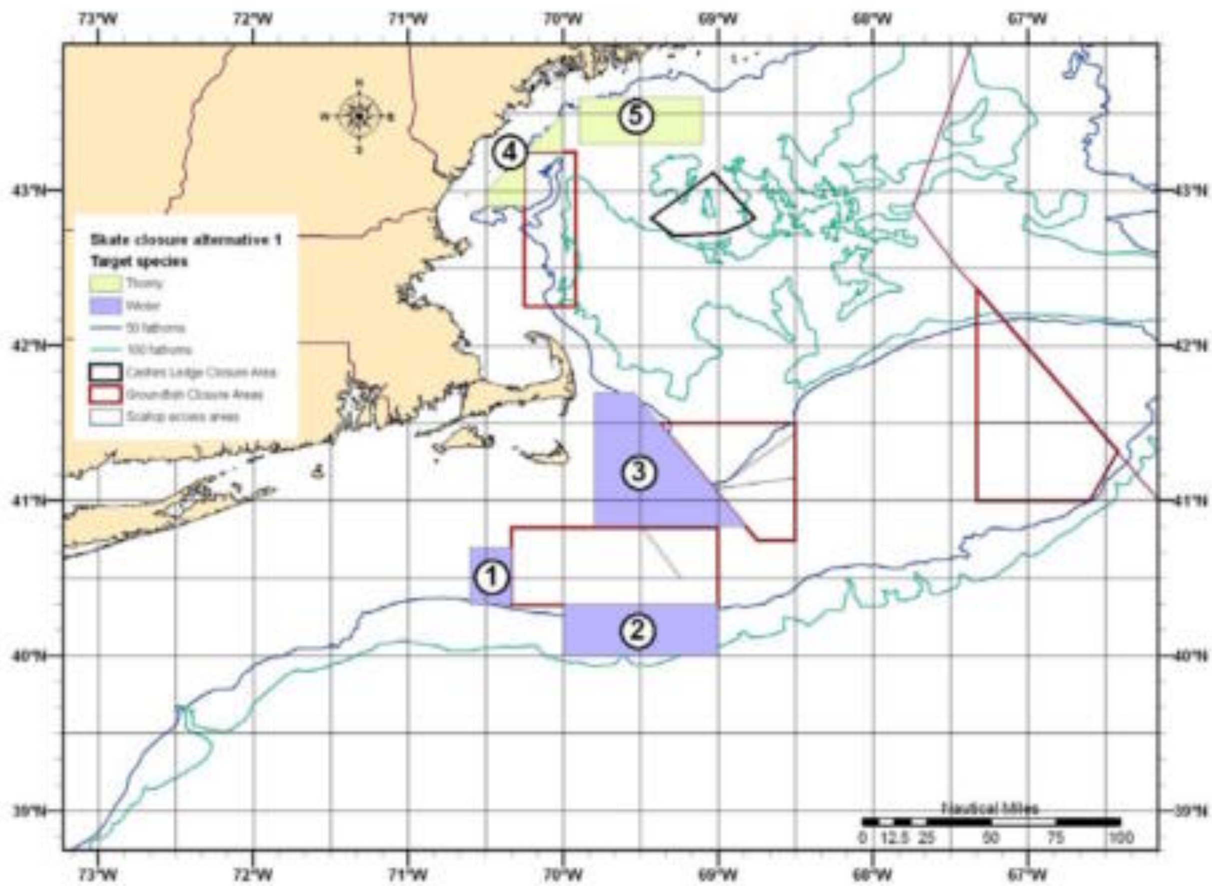
FROM: Andrew Applegate

SUBJECT: **Two-bin model analysis of gear restricted and closed skate areas**

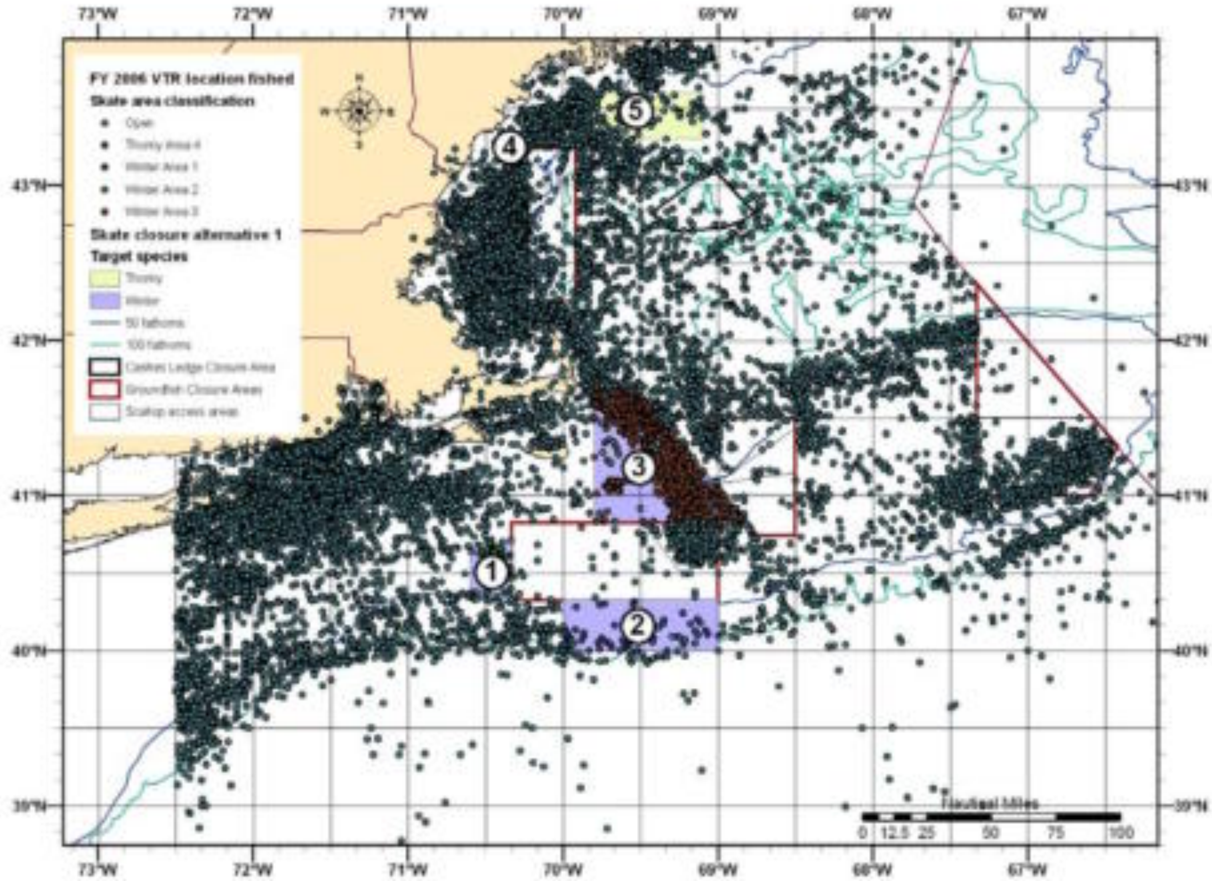
As part of the Amendment 3 alternatives, the PDT identified five potential seasonal closures that could reduce skate mortality, both in the directed skate fishery and as incidental catch when targeting other species. Based on 2004-2007 observed trips, the PDT identified five areas (Map 9) that showed promise due to high skate catch rates and/or survey indices (see Appendix TBD???). Two areas were identified as semi-annual closures for mobile fishing gear to protect thorny skates. Three areas were identified as semi-annual closures for mobile fishing gear to reduce winter skate mortality. Trips recorded in the Vessel Trip Report system (VTR) between May 1, 2006 and April 1, 2007 were classified as being in one of the proposed closure areas based on location and date of landing, or designated as being from an area that would remain open for fishing (Map 10). Fishing year 2006 data were chosen for analysis because implicitly any analysis of effort displacement would reflect the conditions and catches elsewhere under groundfish emergency action and Framework 42 rules.

Area designation	Closure period
Winter Area 1	Jan - Jun
Winter Area 2	Jan – Jun
Winter Area 3	Jul - Dec
Thorny Area 4	Jan – Jun
Thorny Area 5	Jul - Dec

Map 9. Proposed skate closure areas, identified by the Skate PDT as having high commercial and/or survey catches of winter and thorny skates.



Map 10. Classification of commercial fishing trips based on VTR locations fished and landing date.



There are three types of modeling approaches to analyze the potential effects of closures. The most simplistic (and unrealistic) is to assume that the trips which previously fished in the potential area closures will not occur. This is simply the proportion of skate catches that occurred within the proposed boundaries. It represents the maximum conservation effect that could be expected, all other things being equal. But it fails to account for the ability of fishing vessels to mitigate the effects by fishing elsewhere for the same or other species.

A second approach is a two-bin model, which assumes that all trips within potential closure areas will be displaced elsewhere. It was used to analyze groundfish closures in the late 1990s and displaced trips are assumed to have the mean catch of all other trips occurring outside the boundaries of the potential closures. The effect of displacement can be refined by limiting the pool of trips (by gear, region, vessel size, port, etc.) that represent the catch if the displaced trip fishes elsewhere. The potential conservation effect (or in some cases, catch increases) accrues because of the difference in CPUE inside vs. outside of the proposed closure (Equation 1). This model is known to underestimate the effectiveness of closures (and minimize the estimated costs) because trips are displaced to other areas regardless of the profitability of the displaced trip, the new distance from port, the suitability of vessels to fish in other areas, or other limits on DAS or landings that influence the profitability of displaced trips.

Equation 1 – Standard 2 bin displacement, region constrained

$$\Delta L = Effort_{inside} * \Delta LPUE_{species,region}$$

A third approach allows for trip displacement based on an objective function, e.g. profit maximization. Such a model would account for DAS restrictions and possession limits, classifying displaced trips to fish like trips in the remaining open areas, but where profits from similar vessels are maximized. If the displaced trips would be unprofitable or other limits (like DAS) prohibit the displacement, the model would treat the trip as not occurring at all. This Council used this type model to evaluate groundfish closures as recently as for Framework 42, using a General Additive Model (GAMs) framework. The latest groundfish analysis appears to have predicted groundfish catches quite well (Tom Nies and John Walden, pers. comm.)

The Skate PDT reviewed the attributes of these models and found that while the two-bin model might be useful to derive a rough, preliminary estimate of the effectiveness of closures, the groundfish closed area model would provide much more accurate predictions. The skate fishery operates under several related fishery regulations, many associated with the multispecies fishery. Ignoring these restrictions (most notably the effect of DAS regulations) would cause inaccurate results and underestimate the effectiveness of the proposed areas. The Council and the Skate PDT preferred to re-configure the pre-existing groundfish closed area model to analyze the proposed skate area closures, but the Northeast Fishery Science Center (NEFSC) denied the Council's request to reconfigure and use the groundfish closed area model.

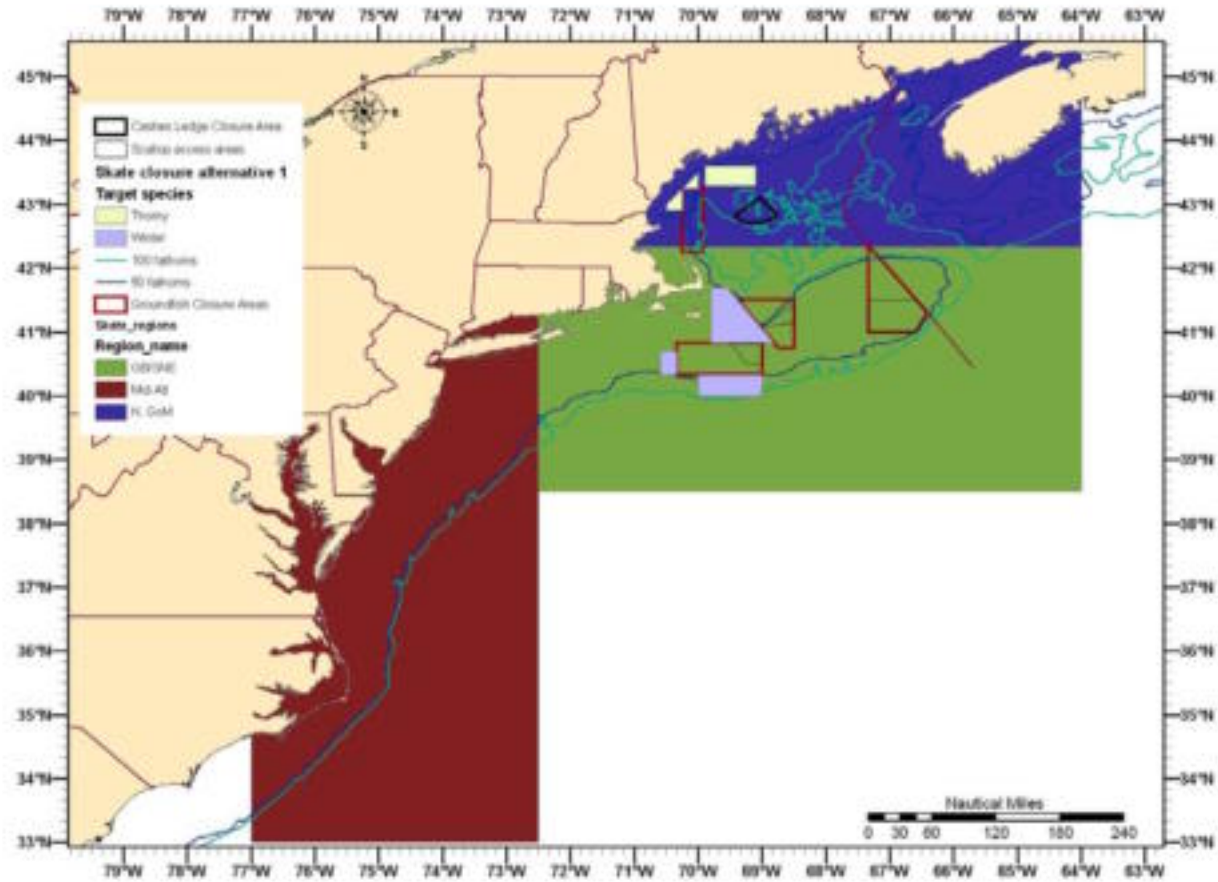
Two bin model results

Without access to the groundfish closed area model, it would take a long time and external expertise to independently develop a GAMs-based closed area model. Furthermore, other refinements to the two-bin model beyond what the PDT applied would make the two-bin model take a GAMs based approach.

In lieu of developing a new model, the following results using the two bin model are reported, with the caveat that the results underestimate the effectiveness of closed areas to reduce skate mortality and also underestimate the short term costs of area closures caused by trips that cannot be fished elsewhere at a profit. Likewise, the model probably overestimates the effect on other species if the catch rates are higher outside of the proposed closed area than within.

The PDT nonetheless made two improvements to the standard two bin model, adapted from SAS code supplied by John Walden, NEFSC. One change the PDT made was to run the analysis by region: Northern Gulf of Maine, Georges Bank/Southern New England, and Mid-Atlantic (Map 11). This modification prevented the displacement by the model of trips into distant areas where the same vessel is unlikely to fish. Thus a trip displaced from a winter skate closure was assumed to have the catch of skates and other species only in the Georges Bank/Southern New England region. Likewise, a trip displaced from the thorny skate closed areas was assumed to have a catch equal to the average for the Northern Gulf of Maine. Mid-Atlantic trips were given no further consideration, since no closures in that region were evaluated.

Map 11. Regions defined to analyze skate landings data in VTRs and skate observed discards: Georges Bank/Southern New England (GB/SNE), Mid-Atlantic (Mid-Atl), Northern Gulf of Maine (N. GoM).



The second modification was to adapt the model to account for skate discards. Since more than 40% of the total catch is comprised of discards, the effect of area closures on skate discards is an important issue. Skate discards inside the proposed closures were expanded to the total by applying the observed discard to kept (all species) ratio to total landings (Equation 2). Discards for the displaced trips were calculated by applying the discard to kept ratio in areas outside of the proposed area closures to the expected change in total landings (Equation 3).

Equation 2 – Total discards in closed areas

$$\Sigma D = \Sigma Kept_{inside} * \left(\frac{\Sigma Disc_{observedskates}}{\Sigma Kept_{all,observed}} \right)$$

Equation 3 –2 bin displacement with discards, region constrained

$$\Delta C = Effort_{inside} * \Delta LPUE_{species,region} + \left(\frac{\Sigma L}{\Sigma Effort} \right)_{Out} * \left(\frac{\Sigma Disc}{\Sigma Kept} \right)_{Out} * Effort_{inside}$$

The PDT analyzed 45,507 trips recorded in the Vessel Trip Report system between May 1, 2006 and April 30, 2007 (

Table 1). Trip duration for all trips was 62,710 days absent, landings 15.2 million pounds of whole skates and 5.9 million pounds of skate wings. Trips were classified by reported gear type and mesh (small: ≤ 5.5 inches; large: > 5.5 inches) to represent separate fisheries. Out of these trips, there were 3,127 trips in the proposed closed areas with a total duration of 5,750 days, landing 1.7 million pounds of whole skates and 2.7 million pounds of skate wings (
Table 1).

Table 1. Distribution of effort, landings, and skate discards by gear with respect to the proposed skate closure areas.

	VTR landings, all areas	Thorny Area 4	Winter Area 1	Winter Area 2	Winter Area 3	Total in closure areas	Percent in closure areas
Total days absent	62,710	178	203	79	5,289	5,750	9.2%
Total landings, lbs.	190,267,251	1,148,715	1,234,352	498,027	11,474,836	14,355,930	7.5%
Whole skates, lb.s	15,214,903	20	672,351	200,080	827,768	1,700,219	11.2%
Skate wings, lbs.	5,853,990	281	223,580	134,901	2,334,602	2,693,364	46.0%
Skate discards, lbs.	60,140,013	115,381	350,245	103,192	3,538,738	4,107,557	6.8%
Winter skate discards, lbs.	20,364,874	3,002	91,077	46,658	1,871,033	2,011,770	9.9%
Thorny skate discards, lbs.	1,201,565	100,948	0	0	48,517	149,466	12.4%
Cod, lbs.	11,081,217	26,617	900	450	1,271,338	1,299,305	11.7%
Haddock, lbs.	5,315,015	1,764	100		476,233	478,097	9.0%
Winter flounder, lbs.	5,243,626	242		30	1,170,933	1,171,205	22.3%
American plaice, lbs.	2,085,104	376	150		19,854	20,380	1.0%
Witch flounder, lbs.	2,892,155	317	2,110	100	59,061	61,588	2.1%
Windowpane flounder, lbs.	303,790	11			3,193	3,204	1.1%
Yellowtail flounder, lbs.	4,244,782	930		250	102,391	103,571	2.4%
Pollock, lbs.	12,420,029	3,894	2,500		347,220	353,614	2.8%
Redfish, lbs.	1,052,859	644			30,314	30,958	2.9%
White Hake, lbs.	1,747,490	125	2,500		10,843	13,468	0.8%
Small mesh groundfish species, lbs.	12,513,722	285	7,286	17,300	38,876	63,747	0.5%
Monkfish, lbs.	16,633,551	369	139,729	90,468	694,844	925,410	5.6%
Scallop meats, lbs.	38,641,356		2,900		3,872,231	3,875,131	10.0%

Total skate discards for all trips were estimated to be 21.4 million pounds, with 4.1 million lbs. (6.8%) of skate discards on trips reported to fish within the proposed closed areas (Table 1). Forty-six percent (46%) of skate wing landings were caught in trips reported to fish within the five proposed area closures, most from Winter Area 3. Only 11.2% of skate wing landings came from trips reported to be fishing in the proposed areas. Also of note were 22.3% of winter flounder landings and 11.7% of cod landings originating from the proposed closures.

The net change in landings and skate discards for trips reported to fish on one of the five proposed areas are shown in Table 2 and Table 3. Trips that targeted skates (more than half of landings were skates) were analyzed separately from those that did not. The drawback of this approach was that the model did not allow affected trips targeting skates to fish in other areas for other species, which might be a more profitable choice. This assumption did, however, allow displaced trips targeting skates to fish for whole skates, rather than wings, and vice versa. It could be possible that vessels targeting skates may in fact target smaller skates with a bait letter of authorization, rather than target large skates elsewhere for the wing market.

Trips within the proposed closures fished for a total of 521 days while targeting skates (Table 2), mostly with large mesh trawls and gillnets. Most of the skate conservation would occur through the displacement of vessels using gillnets to target skates and land wings. The model predicts that wing landings would decline by 1.5 million pounds and whole skate landings would increase by 1.3 million pounds. Although there is a mix of skate species in the whole/bait skate fishery, this shift would benefit winter skate and would increase mortality of little skate. Estimated skate discards would increase by about 260,000 lbs, with decreases in the gilnet fishery more than offset by increases in the trawl fishery. The model estimates that cod landings would also decline (by 120,000 lbs.) as an incidental catch by vessels targeting skates, mostly by vessels using large mesh trawls, but monkfish landings would increase by 122,000 lbs. It is unclear whether the monkfish landings increase could actually occur due to monkfish possession limits.

Table 2. Predicted net change in landings and skate discards for vessels targeting skates.

	Large mesh trawl	Small mesh trawl	Large mesh gillnet	Small mesh gillnet	Dredge	Hook	Net change for trips fishing for skates
Total days absent	208	20	294				521
Total landings, lbs.	1,155,991	55,861	-1,337,470				-125,618
Whole skates, lb.s	1,237,595	29,025	58,743				1,325,363
Skate wings, lbs.	-87,502	17,166	-1,384,802				-1,455,138
Skate discards, lbs.	389,653	18,421	-147,927				260,147
Cod, lbs.	-86,734	-4,964	-29,068				-120,767
Haddock, lbs.	5,012	910	-374				5,548
Winter flounder, lbs.	-22,181	-2,864	4,814				-20,230
American plaice, lbs.	2,896	97	0				2,993
Witch flounder, lbs.	5,946	258	-3				6,201
Windowpane flounder, lbs.	2,343	6	0				2,348
Yellowtail flounder, lbs.	41,541	6,938	27				48,506
Pollock, lbs.	-3,921	0	-4,451				-8,372
Redfish, lbs.	81	0	0				81
White Hake, lbs.	395	0	-31				364
Small mesh groundfish species, lbs.	139	256	0				395
Monkfish, lbs.	7,728	2,556	111,290				121,574
Scallop meats, lbs.	2,037	455	226				2,717

Trips that landed skates incidental to fishing for other species while in the proposed closed areas totaled 5,213 days absent (Table 3). The two-bin model predicts that landings of both wings and whole skates would decline (147,000 and 347, 000 lbs, respectively). The model also predicts that skate discards from incidental catch would also decline by 116,000 lbs.

Thus total skate catches for vessels fishing for other species (Table 3) would decline as expected (because the observed skate catches in the proposed closures were higher than those elsewhere), but about one-half million lbs, mostly by vessels using large mesh trawls. Cod and winter flounder landings are expected to decline also; perhaps considerably more than skate catches. Monkfish, yellowtail flounder, and small mesh groundfish landings are expected to increase from the proposed closures. The model also predicts a substantial increase in scallop landings (2.57 million pounds), but this is a spurious result. Because the data for vessels using dredges did not distinguish between limited access and general category vessels (the latter having a 400 lbs. possession limit), the model estimates that the displaced effort would have the same catches of other scallop vessels fishing on Georges Bank (which are mainly limited access vessels). As a result, the model incorrectly predicts that the general category vessels that have been fishing in the South Channel (Winter Area 3) would be displaced and fish like the limited access vessels that target Georges Bank scallops.

Total whole skate landings by all vessels and trips were predicted to increase by 7.7%, while skate wing landings would decline by 31%. Skate discards were predicted to decline by 0.2% Winter flounder (-16%), cod (-7%), and haddock (-4%) were also predicted to decline, while slight increases were predicted for other species due to higher LPUEs outside of the proposed closures.

Table 3. Predicted net change in landings and skate discards for vessels targeting species other than skates. The targeted and incidental change column includes the predicted net change in catches from Table 4.

	Large mesh trawl	Small mesh trawl	Large mesh gillnet	Small mesh gillnet	Dredge	Hook	Net change, trips targeting other species	Targetd and incental change
Total days absent	910	227	218	1	3,778	79	5,213	9.1%
Total landings, lbs.	-1,209,990	53,905	-293,986	-1,176	2,495,024	984	1,044,761	0.5%
Whole skates, lb.s	-159,601	325	12,702	1	254	-272	-146,591	7.7%
Skate wings, lbs.	-247,095	-17,727	-79,663	-27	0	-2,050	-346,563	-30.8%
Skate discards, lbs.	-352,205	273,936	-37,891	-35			-116,195	0.2%
Cod, lbs.	-509,215	-42,806	-212,893	-327	-179	-38,708	-804,129	-7.4%
Haddock, lbs.	-209,866	-347	-5,470	2	544	412	-214,725	-4.0%
Winter flounder, lbs.	-809,463	-19,846	-1,545	3	1,167	-202	-829,886	-15.7%
American plaice, lbs.	50,526	1,275	11	0	1,001	0	52,814	2.6%
Witch flounder, lbs.	62,605	2,281	28	1	575	0	65,490	3.9%
Windowpane flounder, lbs.	16,836	17	3	0	-13	0	16,843	2.8%
Yellowtail flounder, lbs.	137,360	-1,000	2,427	1	1,559	2	140,348	3.3%
Pollock, lbs.	-16,137	2,875	-118,384	352	0	15	-131,279	-1.1%
Redfish, lbs.	-566	281	3,192	0	0	11	2,919	0.3%
White Hake, lbs.	14,182	1,921	1,008	36	-24	755	17,877	8.0%
Small mesh groundfish species, lbs.	9,645	107,443	1,862	0	-6	331	119,274	1.0%
Monkfish, lbs.	108,667	-1,341	222,739	125	-40,267	-130	289,793	1.7%
Scallop meats, lbs.	49,155	959	40	0	2,570,152	0	2,620,306	6.8%

Conclusion

In summary, the two bin model predicts a substantial decline in skate wing landings, but a potential increase in whole skate landings if the displaced trips are fished elsewhere in the Georges Bank/Southern New England region. While the closures could help reduce skate discards for vessels fishing for other species, particularly for the large mesh trawl fishery, it could be offset by increases in skate discards by vessels using other gears and/or vessels using trawls to target skates.

Thorny skate discards in Area 4 accounted for 10% of the total and despite the low fishing effort (178 days) and catches of groundfish, a closure of this area could be effective at reducing bycatch of thorny skate. Most of the landings by trips reported to be fishing in Area 4 were of species that were not summarized in this analysis (possibly herring?). There was no VTR effort reported for Area 5, so the two bin model was unable to predict any change in catch. The fall survey data, however, indicated a concentration of high thorny skate biomass in this area. Closure to mobile fishing gear could prevent an increase in thorny skate discards if vessels begin fishing here for other species.

If the Council chooses area closures as one measure to enhance rebuilding of winter and thorny skates, it might classify them as gear restricted areas to reduce skate bycatch and incidental skate landings. Trips landing cod and herring appear to be the ones most affected by the proposed skate closures. Despite the automatic trip displacement assumption, the two bin model predicts cod landings would decline by 804,000 lbs. (7.4%) and winter flounder landings would decline by 830,000 lbs. (15.7%) The effects on landings of other species appears to be minimal due to the forecasted trip displacement. On the other hand, the area closures could increase fishing costs if vessels have to travel further and fish on longer trips. The winter skate closure areas could be effective for reducing winter skate landings and discards, particularly if they apply to the gillnet fishery.

11. Document 11

Two-bin model analysis of potential skate closure options

Applegate 2008

New England Fishery Management Council
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John Pappalardo, *Chairman* | Paul J. Howard, *Executive Director*[6]

MEMORANDUM

DATE: **May 12, 2008**

TO: Skate Oversight Committee and Advisory Panel

FROM: Skate PDT

SUBJECT: **Two-bin model analysis of potential skate closure options**

This memo summarizes the analysis of the management options identified by the PDT at its April 25, 2008 meeting, using the two-bin model that the PDT re-configured to analyze potential skate closures. Combined with skate possession limits to achieve Amendment 3 landings targets and prevent the catch from exceeding the interim TAC, the PDT identified the following three area management options for analysis:

- Time/area closures that apply to vessels that target skate species
- Seasonal gear restricted areas that could apply to vessels fishing with any of the following gears: Trawls (small and large mesh), gillnets, scallop dredges, and hook gear.
- Seasonal gear restricted areas as above, but implemented as an in-season accountability measure (AM) triggered when catch exceeds a specified threshold.

The first management option above would apply the five skate management areas (see July 30, 2007 PDT memo titled, "An evaluation of survey distribut5ion and observed skate CPUE to identify areas that could reduce skate mortality", http://www.nefmc.org/skates/tech docs/Area management analysis.pdf) as time/area closures to prohibit fishing by vessels targeting skate species. Map 1 and Table 1 describe the proposed areas and seasons when they would be closed to vessels fishing for skates. Three areas around the Nantucket Lightship Area are intended to reduce or limit winter skate mortality and two areas near the Western Gulf of Maine closed area are intended to reduce or limit thorny skate mortality.

[6] For the purposes of analysis, this has been defined as vessels whose skate landings exceed 50% of the total. Any value could be used, but in reality if this management option is applied the Council would have to define a low skate possession limit for vessels unless they declared themselves to be on a trip targeting skate species. When the vessel made such a declaration, than they would be prohibited from fishing in any of the skate closures.

Map 12. Proposed skate closure areas, identified by the Skate PDT as having high commercial and/or survey catches of winter and thorny skates.

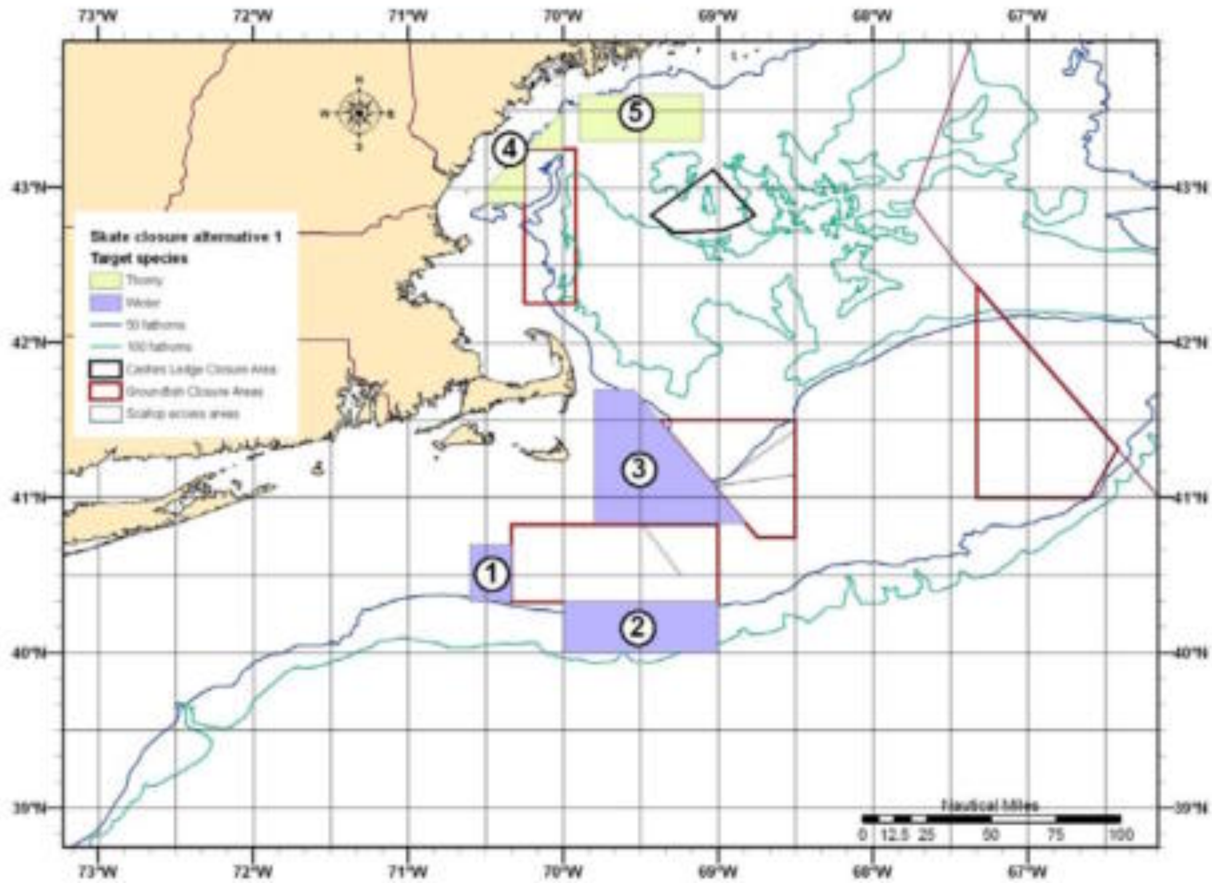


Table 4. Potential seasonal closures by skate management area to fishing.

Area designation	Time/area closures to vessels targeting skates	Gear restricted areas for vessels using trawls, gillnets, dredges, and hook gears
Winter Area 1	Jan - Jun	Jan - Jun
Winter Area 2	Jan – Jun	Jan – Jun
Winter Area 3	Jul - Dec	Open year around
Thorny Area 4	Jan – Jun	Jan – Jun
Thorny Area 5	Jul - Dec	Jul - Dec

The PDT's two-bin model analysis (see December 5, 2007 PDT memo titled, "Two-bin model analysis of gear restricted and closed skate areas, http://www.nefmc.org/skates/tech docs/Two Bin Model results.pdf) of these closures was updated to include calendar year 2007 vessel trip report data for trips having more than 50% of landings from skates, and include trips from both the wing and whole/bait skate fisheries. The two-bin model is a simple analysis that assumes that trips simply occur in areas that remain open to fishing and that total fishing time remains constant. The basic model allows fishing effort to shift into open areas during any time during the year, which is probably a realistic assumption. Skate discard rates in skate management and open areas are calculated from mean discard to kept ratios on observed trips. Mortality changes are estimated from the relative differences in skate CPUE. More details about the model are described in the December 5, 2007 PDT memo.

The PDT's second and third management option would close the same areas, except for Winter Area 3, which is in the South Channel where important fisheries targeting other species take place. Option 3 only differs from option 2 with respect to the length of the potential closure, because the areas may close at an undetermined time during the fishing year. The PDT decided to exclude Winter Area 3 from an analysis of gear restricted areas due to high costs and impacts from closing this area to protect skates.

Management options 2 and 3 would apply to all fishing using gears capable of catching skates, i.e. trawls, dredges, gillnets, and/or hook gear. Data for the two bin model analysis for these options included all vessels that landed skates, but Winter Area 3 (see map) was classified as an open fishing area (and allowed to absorb displaced fishing effort due to closures of other areas). Separate analyses were conducted for vessels targeting skates (i.e. >50% of landings were from skates) vs. other species (i.e. skate landings were incidental), therefore the model did not account for the possibility that trips may take on a different character and target species when fished elsewhere.

Based on the updated two bin model analyses, the following conclusions are evident:

- The effect of potential time/area closures on skate catches during calendar year 2007 are similar to those estimated for fishing year 2006. However, the change in wing skate landings in 2007 is half of that estimated using FY2006 data (-788,000 lbs. vs. -1,455,000 lbs. for vessels targeting skates, Table 2). The effect on predicted whole skate landings is not as much, however, (+124,000 lbs. vs. +1,325,000 lbs.).
- Closure of skate areas 1-5 to vessels targeting skates is estimated to reduce skate wing landings by 11.8% percent, but the model estimates that whole skate landings would increase by 0.6% percent and skate discards would increase by 1.2% percent due to an effort shift from the closed areas to open areas.
- Closure of skate areas 1, 2, 4, and 5 to vessels fishing with trawls, gillnets, dredges, and hook gear is estimated to increase wing landings by 1.0%, increase whole skate landings by 0.4%, and increase skate discards by 3.5% (Table 3).
- Winter Area 3 has the greatest effect for reducing skate landings and catch, particularly for vessels targeting skates.
- Area closures, whether they apply to vessels targeting skates or other species, could cause fishing effort to shift into areas where skate LPUE or discard rates are higher than the area being closed. This effect could be problematic if fishing effort shifts from Winter Areas 1 and 2 to Winter Area 3, for example. Average open area average CPUE is higher than the weighted average for target and non-target trips in skate areas 1, 2, 4, and 5; due to the inclusion of Winter Area 3 CPUE in the open area average, reflecting a potential effort shift into an area where skates are more abundant.
- The PDT notes that gear restricted areas that apply to vessels targeting species other than skates may force vessels to fish in areas where the target species is not as abundant, possibly altering fishing behavior and causing unexpected results.

It is more difficult to predict the outcome of using the four potential gear restricted areas as an accountability measure, because the timing of such closures is uncertain and unpredictable. In general, however, the PDT anticipates that such closures could be less effective than a closure for the entire intended time period, because there is more opportunity to take trips at other times of the year.

To estimate specifications that would achieve the catch/landing targets, the relative change in skate catch/landings from area closures should be multiplied by the change in skate landings caused by the proposed skate possession limits. Thus, if the area closures are expected to achieve a 25% reduction in skate wing landings, for example, a skate possession limit would need to reduce wing landings by 14.7 percent to achieve an overall 36% reduction in skate wing landings (0.75 x 0.853 = 0.64).

Table 5. Predicted net change in landings and skate discards for vessels targeting skates during proposed closed seasons in skate areas 1, 2, 3, 4, and 5.

	Large mesh trawl	Small mesh trawl	Large mesh gillnet	Small mesh gillnet	Dredge	Hook	Net change for trips fishing for skates	Change from status quo
Total days absent	276	11	440				726	1.4%
Total landings, lbs.	1,582,731	17,336	-2,095,188				-495,121	-0.3%
Whole skates, lb.s	1,642,302	25,786	-1,544,460				123,629	0.6%
Skate wings, lbs.	-92,775	-10,709	-684,844				-788,328	-11.8%
Skate discards, lbs.	527,952	5,832	-284,511				249,274	1.2%
Cod, lbs.	-77,728	-6,200	-12,980				-96,908	-1.5%
Haddock, lbs.	-9,463	68	-59				-9,453	-2.4%
Winter flounder, lbs.	47,700	46	8,442				56,188	0.4%
American plaice, lbs.	3,993	-24	0				3,969	0.1%
Witch flounder, lbs.	6,542	12	-3				6,551	0.1%
Windowpane flounder, lbs.	2,187	4	0				2,191	0.1%
Yellowtail flounder, lbs.	31,837	1,668	58				33,563	1.5%
Pollock, lbs.	-1,342	0	-1,594				-2,936	-0.9%
Redfish, lbs.	289	0	0				289	0.0%
White Hake, lbs.	356	0	1,814				2,169	0.0%
Small mesh groundfish species, lbs.	92	752	-10				834	0.1%
Monkfish, lbs.	-32,360	815	209,485				177,941	10.0%
Scallop meats, lbs.	1,817	123	20				1,960	0.0%

Table 6. Predicted net change in landings and skate discards for vessels targeting skates during proposed closed seasons in skate areas 1, 2, 4, and 5.

	Large mesh trawl	Small mesh trawl	Large mesh gillnet	Small mesh gillnet	Dredge	Hook	Net change for trips fishing for skates	Change from status quo
Total days absent	80		109				189	0.4%
Total landings, lbs.	220,179		23,329				243,508	0.1%
Whole skates, lb.s	213,483		-126,320				87,163	0.5%
Skate wings, lbs.	-53,753		134,641				80,889	1.3%
Skate discards, lbs.	214,343		23,342				237,685	1.2%
Cod, lbs.	4,646		27				4,672	0.1%
Haddock, lbs.	32,539		1,308				33,848	9.1%
Winter flounder, lbs.	1,615		0				1,615	0.0%
American plaice, lbs.	2,565		2				2,567	0.0%
Witch flounder, lbs.	-2,104		0				-2,104	0.0%
Windowpane flounder, lbs.	13,354		12				13,366	0.7%
Yellowtail flounder, lbs.	555		458				1,013	0.0%
Pollock, lbs.	375		0				375	0.1%
Redfish, lbs.	146		342				488	0.0%
White Hake, lbs.	40		2				42	0.0%
Small mesh groundfish species, lbs.	17,314		89,784				107,098	6.9%
Monkfish, lbs.	-65,154		-102,394				-167,548	-9.4%
Scallop meats, lbs.	0		0				0	0.0%

Table 7. Predicted net change in landings and skate discards for vessels targeting species other than skates during proposed closed seasons in skate areas 1, 2, 4, and 5. The last column is the predicted cumulative change in catch from vessels targeting species other than skates (this table) and from vessels targeting skates (table above).

	Large mesh trawl	Small mesh trawl	Large mesh gillnet	Small mesh gillnet	Dredge	Hook	Net change, trips targeting other species	Targeted and incidental change
Total days absent	48	214	51		14	16	343	1.0%
Total landings, lbs.	27,336	27,811	-5,914		-17,410	-6,385	25,438	0.2%
Whole skates, lb.s	3,454	379	-11,679		5	14	-7,828	0.4%
Skate wings, lbs.	2,247	492	-20,829		0	57	-18,032	1.0%
Skate discards, lbs.	22,312	447,827	-14,034		0	-2,788	453,317	3.5%
Cod, lbs.	459	572	-4,341		0	8,316	5,006	0.0%
Haddock, lbs.	5,635	475	916		13	20	7,060	0.1%
Winter flounder, lbs.	6,055	585	22		1	0	6,663	0.1%
American plaice, lbs.	5,793	156	42		2	21	6,013	1.0%
Witch flounder, lbs.	366	20	1		0	0	388	0.1%
Windowpane flounder, lbs.	6,733	415	734		4	0	7,886	2.4%
Yellowtail flounder, lbs.	28,001	1,978	16,872		0	6	46,857	1.3%
Pollock, lbs.	-4,497	395	-473		0	58	-4,517	0.0%
Redfish, lbs.	3,788	2,614	642		0	98	7,142	7.3%
White Hake, lbs.	536	180,310	467		0	70	181,383	0.8%
Small mesh groundfish species, lbs.	17,963	-28,055	90,604		875	12	81,399	0.6%
Monkfish, lbs.	-4,895	-2,556	-124,082		20,340	0	-111,194	-0.8%
Scallop meats, lbs.	0	0	0		-38,455	0	-38,455	-0.2%

12. Document 12

Skate possession limit analysis

Applegate 2007

MEMORANDUM

DATE: **October 18, 2007**

TO: Skate PDT

FROM: Andrew Applegate

SUBJECT: **Amendment 3 possession limit analysis**

At our last meeting on Sept. 25, 2007, Kathy Sosebee presented results from a descriptive analysis of three possession limits for the wing fishery: 6,000; 8,000, and 10,000 lbs. of wings. The current possession limit is 20,000 lbs. of wings and no limit for vessels having a Bait Letter of Authorization.

The descriptive analysis from our last meeting was useful as a preliminary indication of the proportion of trips that would be affected at various possession limits. The percent of landings affected was a measure of the landings of skates from trips which exceed the possession limit, not the amount of skate landings that would be prohibited. As such, the analysis had limited utility and no analysis of the bait fishery was available.

Skate fishery possession limits (and in some cases, a winter skate possession limit) are one of the tools in the arsenal of measures to reduce or cap skate mortality and initiate rebuilding of winter and thorny skate. The PDT has long recognized the difficulty that people have in correctly identifying winter and little skates, particularly when they are juveniles. Therefore many of the alternatives have measures that identify a skate fishery possession limit as a means to reduce or cap mortality on the skate complex. Other measures based on the distribution of thorny and winter skates are more likely to target reductions on those particular skate species.

Possession limits are intended to reduce the incentive to target skates by making it more costly to fish for them. Fishermen may respond by taking shorter trips, continuing to fish for other species, or taking fewer trips targeting skates when it is less profitable than alternative target species. And although possession limits can be very effective in reducing landings (particularly when trips are limited by DAS), they can promote discarding when a vessel continues to fish for other species. The difficulty is predicting what will happen.

The analysis presented here is very similar to the analysis of groundfish possession limits for Framework 42. Eric Thunberg provided some guidance, and I applied the conceptual possession limit decision model for Framework 42 to the skate fisheries, using a combination of SQL and Excel. The attached tables in the Excel file are the results for various potential possession limits (3,000; 4,000; 6,000; 8,000, 10,000 of wings; 5,500; 7,000, 10,000; 12,000; and 22,700 lbs. of whole skates) and discard mortality assumptions (25 and 50%).

Input parameters were applied to trips that the VTR indicated landed whole skates, wings, or both. The trip was classified as a wing fishery trip if it had more skate landings as wings (converted to live weight) than it did whole skates, and vice versa. A region fished (Gulf of Maine, Georges Bank, Southern New England, Mid-Atlantic) was assigned based on the CAREA on the VTR and ex-vessel prices were assigned by species and month. The results could be summarized by region, state and port of landing, gear (GNS=sink gillnet; OTF=finfish trawl), skate fishery, and whether the trip was over the possession limit. For trips that met exceed the skate possession limit and stopped fishing (because the variable fishing costs exceeded revenue from non-skate species), the catches of gadoids, flounders, yellowtail flounder, monkfish, dogfish, other groundfish, and others species were adjusted assuming constant landings per DA.

Results

Mortality reductions are calculated from the affected trips landing the possession limit and either ceasing fishing when the possession limit is met, or continuing to fish and discarding the difference. The discards are partitioned into dead discards (which do not contribute to mortality reduction) and surviving discards (which do) by apply the assumed discard mortality. No additional discards of non-skate species was calculated, because the landings of these species were reduced only if the trip ended early.

The analysis matched the 2006 VTR to permit and price data for 9,788 trips landing at least one pound of skates from 525 unique vessels. Some data were excluded because the trip data did not match a valid permit at the time of landing, and therefore the daily variable cost of fishing could not be calculated. The analyzed data set accounted for 96 percent of total reported skate wing landings, 94.4% of total whole skate landings, 84% of trips landing skates, and 83.2% of vessels with trips landing skates in the 2006 VTR data. Just because a trip did not match a permit (by vessel ID, permit start date, and permit end date) at one time, did not necessarily mean that other trips by the vessel were also excluded. The trip may have matched a valid permit for the vessel issued at a different time.

Figure 11 shows an example of how a possession limit affects individual trips. In this example, a different possession limit applies to the bait fishery than the one that applies to the wing fishery, so that the reduction in catch is roughly equivalent. Some trips stop fishing when it reaches the possession limit, because the revenue from the landings of non-skate species do not exceed the variable daily fishing costs. Other trips continue to fish, discarding the difference between the original skate landings and the possession limit. In this example, half of the discards are assumed to die. The mortality reduction is the sum of landings represented by 'mortality reduction'.

Out of the 9.877 trips landing skates, there were a substantial portion of trips whose revenue from non-skate species exceeded the daily costs of fishing, including supply costs (fuel, ice, food, supplies), owner share (assuming a 60/40 lay system with the crew paying the expenses), and crew opportunity cost (assuming the crew can net $100 per day by working at an alternative job). For example, with the skate wing possession limit set at 8,000 lbs., there were 4,216 trips that fished with trawls, landed more than the skate possession limit and had non-skate revenue that exceeded the daily fishing cost (Figure 13). There were also an additional 249 trips by vessels using trawls in the wing fishery that more non-skate revenue than daily fishing costs. If the crew opportunity cost is omitted, the model would predict even more trips to continue fishing after catching the skate possession limit.

The mortality reduction and additional discards (expressed as a percentage of the original skate landings) over a range of potential possession limits is shown in Figure 12 and Figure 14 for vessels using trawls in the wing and bait fisheries. With a 10,000 lb. wing possession limit and a 14,000 lb. bait skate possession limit, for example, the estimated skate mortality reduction is 5.3% with 2.2% of the original catch becoming new discards. At the other extreme, a 3,000 lb. wing possession limit and a 5,500 bait skate limit is estimated to produce a 28.5 percent mortality reduction with an increase of discards to 13.2% of the original skate landings. Assuming that discard mortality is only 25% increases the mortality reduction to 35.1% with discards increasing to only 6.6% of the original skate landings.

Due to trips that end early when the skate landings reach the possession limit (and the revenue from non-skate species does not exceed the daily variable cost for the vessel), gadoid landings would decrease by 1.3 (10,000 lb. wing limit; 22,700 lb. bait limit) to 30.7% (3,000 lb. wing limit; 5,500 lb. bait limit) on trips landing skates, flounder landings would decrease by 1.3 to 29 percent, yellowtail flounder landings would decrease by 3.9 to 33.7 percent, monkfish landings would decrease from 0.6 to 27.6 percent, dogfish landings would decrease by 0.2 to 22.9 percent, other groundfish landings would decrease by 0 to 19.0 percent; and other species landings would decrease by 0.5 to 23.6 percent. These results assume, however, that these species do not become viable and profitable alternatives for the time the vessel does not fish for skates because of the skate possession limit.

Conclusions

Even using a model that does not take into account shifts in effort to target other species or the ability of vessels to replace trips that land fewer skates under a possession limit, a very low possession limit would be needed to achieve the target catch reductions associated with those required to rebuild winter and thorny skates. These low possession limits are likely to have severe economic impact on the skate fisheries for ten or more years while winter and thorny skates rebuild, without addressing discards in fisheries targeting non-skate species.

The model

The possession limit analysis model classifies trips into two categories (there are three categories in Table 8, but the one where skate landings were originally below the possession limit are treated mathematically the same as those that continue fishing): those whose variable daily fishing costs (fuel, ice, supplies, gear damage, and food) exceed the value of non-skate species landings and those trips whose revenue is less than cost when skates are not kept. This is basically the same approach used by Eric Thunberg to estimate the effects of Framework 42 groundfish possession limits. Like the groundfish model, a minimum daily crew share of $100 per crew day was also subtracted as a daily labor cost, below which the crew would make less money than other potential alternatives and possibly return early as a result. Equation 1 shows how this relationship was calculated for each trip and vessel on a daily (rather than total) return basis.

In the first case [where revenue from the daily catch of non-skate species exceeds the daily variable cost of fishing (DVC) plus a minimum crew opportunity cost (OC)], the model assumes the vessel stops fishing and returns to port when the skate landings reach the trip limit (assuming constant landings per DA during the trip). The trip length is then recalculated as the skate possession limit divided by the skate landings per DA during the original trip (Equation 2). All other values of landings and net revenue are adjusted proportionally to DA'/DA (Equation 3).

In the second case (where revenues from the VC is less than the DVC plus crew OC), the model assumes fishing continues as before, but the skate landings that are above the possession limit would be discarded. Discard mortality is counted as catch, but the proportion discarded alive count toward mortality reduction.

The net return for each trip is the price times the landings of skates, plus the price times the landings of non-skate species, minus the daily variable costs of fishing by the vessel times the days absent (DA) (Equation 3). Whether the vessel catches the possession limit and returns early or continues fishing (discarding skates), the net trip return (NR) is the same, shown in Equation 5. That is, the NR is the value of the skates landed under the possession limit, plus the value of all other species (adjusted for trip length when the vessel returns early, minus the DVC time the (adjusted) trip length. The economic loss is the difference between the net return without the possession limit (Equation 4) minus the net revenue from the trip under the possession limit (Equation 5).

Prices

Prices by species, market category, and month from dealer (SAFIS) date were associated with the VTR landings by species code (sppcode), after adjusting for live to dressed weight according to accepted NMFS conversions. The price data were used to calculate the daily revenue for the trip to compare with the daily variable costs and classify the trip strategy under a skate possession limit.

Variable cost model

Observed trips in the 2006 sea sampling data for trips landing one or more pounds of skates were analyzed to estimate the daily variable fishing costs (DVC) for all trips in the VTR data. A main effects GLM was performed to estimate coefficients to be applied to the VTR trips based on trip length, crew, and vessel characteristics (from matching permits). This approach is similar that used by Demet Haksever for analyzing scallop fishing costs, who also provided guidance for this analysis.

Daily variable costs (DVC, total trip cost divided by days absent) for fuel, food, ice, and miscellaneous costs (supplies and gear damage) were analyzed with a main effects general linear model (GLM) individually as a function of vessel horsepower (HP), gross tonnage (GRT), hold capacity (HC), crew (CREW), and trip length (DA). Restricted models having selected dependent variables generally improved the performance of the model and helped resolve autocorrelation caused by larger vessels having more HP, larger CREW, and taking longer trips (Figure 17). Source data came from the 2006 observer data for trips where skates were kept, categorized by skate fishery (wing/whole) and gear (trawls, gillnets) for analysis. Trips were treated as independent observations of the vessels landing skates and no culling of the data were performed to eliminate multiple observations of a single vessel.

A main effects model with five dependent variables (CREW, DA, GRT, HoldCap, HP) was estimated separately for each cost component and for the total variable fishing costs. The component models were further refined to a main effects model with two dependent variables, which tended to perform better (Table 9 to Table 12) than the five variable GLM due to a high degree of correlation between the dependent variables.

To generalize, larger vessels tended to fish further offshore on longer trips, carrying more crew, and having more horsepower. With some degree of overlap, the larger vessels tended to operate in the trawl wing fishery, then smaller vessels in the trawl whole skate fishery, and the smallest vessels in the gillnet whole skate fishery (Figure 18 to Figure 20).

The coefficients from the individual models (Equation 6 to Equation 8) were summed and applied to VTR and permit data to estimate the DVC on each trip. Except for vessels using gillnets and landing whole skates, the two-dependent variable GLM for miscellaneous costs (supplies and gear damage) performed poorly and average cost per DA for this component was used in the combined model. Plots of the DVC against the dependent variables are shown in Figure 18 to Figure 20. In general, the daily variable costs increased with crew, trip length, and vessel size as would be expected. Maximum costs were about $1000 per DA for vessels using trawls and landing whole skates or skate wings. Daily costs ranged from $100 to $600 per DA for vessels using gillnets and landing whole skates. There were insufficient observations on trips using gillnets and landing skate wings to draw any conclusions.

A main effects general linear model on the DVC of all components in the sea sampling data were also performed and calculated, but did not perform as well and also gave negative values for 583 trips out of 9877 in the VTR data, due to a negative intercept (Figure 21). In contrast the combined GLM coefficients had no trips with a negative daily cost. The GLM of combined cost components (Equation 6 to Equation 8) produced daily costs estimates for the 9877 VTR trips ranging from $250 to $750 per DA and were compared to the value of non-skate species landings to determine whether the vessel would continue fishing when it reached the skate possession limit (and discard skates up to finish the original trip), or stop fishing and return to port (with less landings of skate and non-skate species).

Figure 11. Adjusted skate landings, discards, and mortality reduction by trip (sorted by total skate landings) with a proposed 8000 lb. wing possession limit for the wing fishery and a 12,000 lb. whole skate possession limit for the bait fishery.

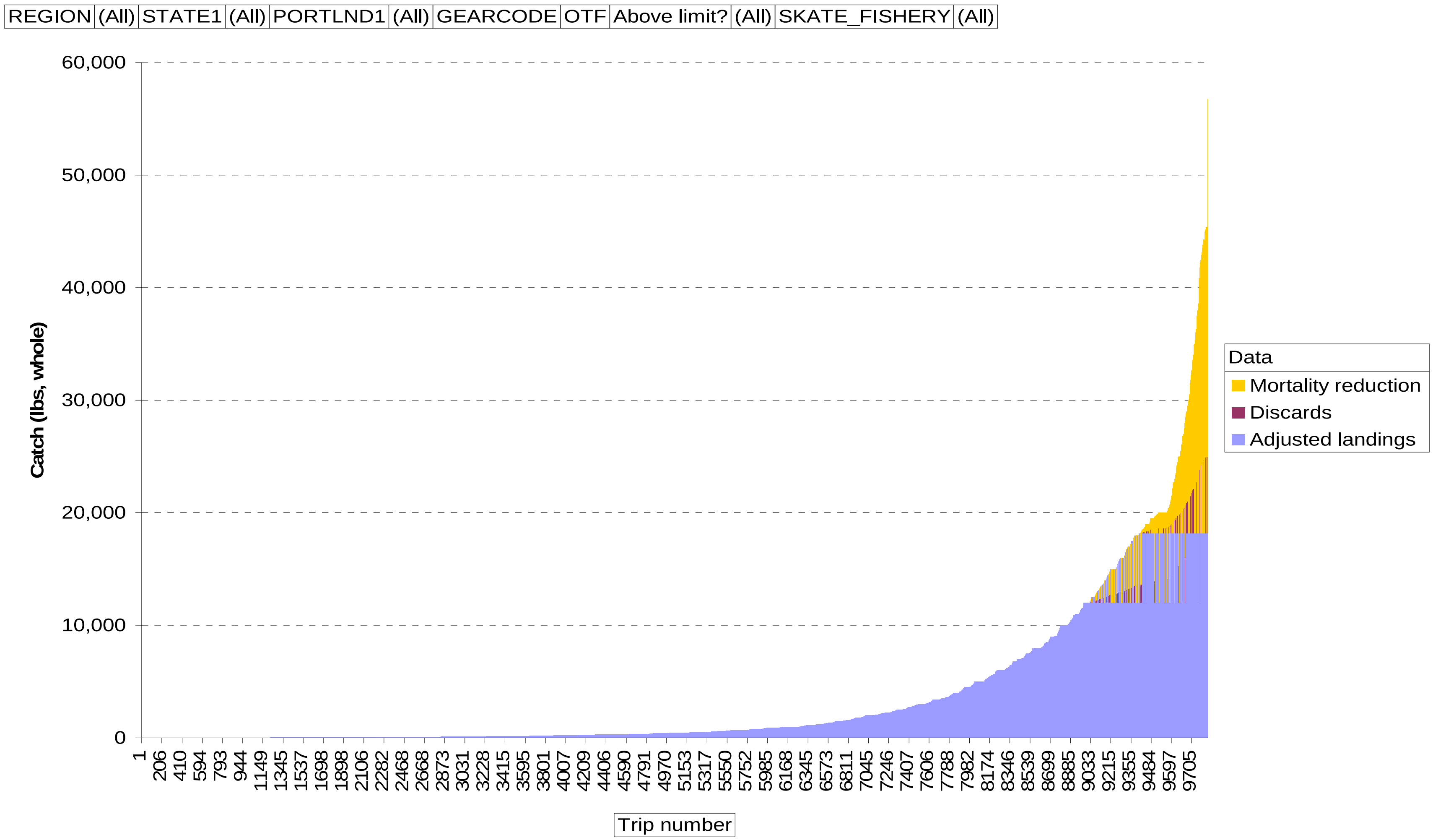


Figure 12. Adjusted skate landings, discards, and mortality reduction by trip (sorted by total skate landings) above a proposed 8000 lb. wing possession limit for the wing fishery and a 12,000 lb. whole skate possession limit for the bait fishery.

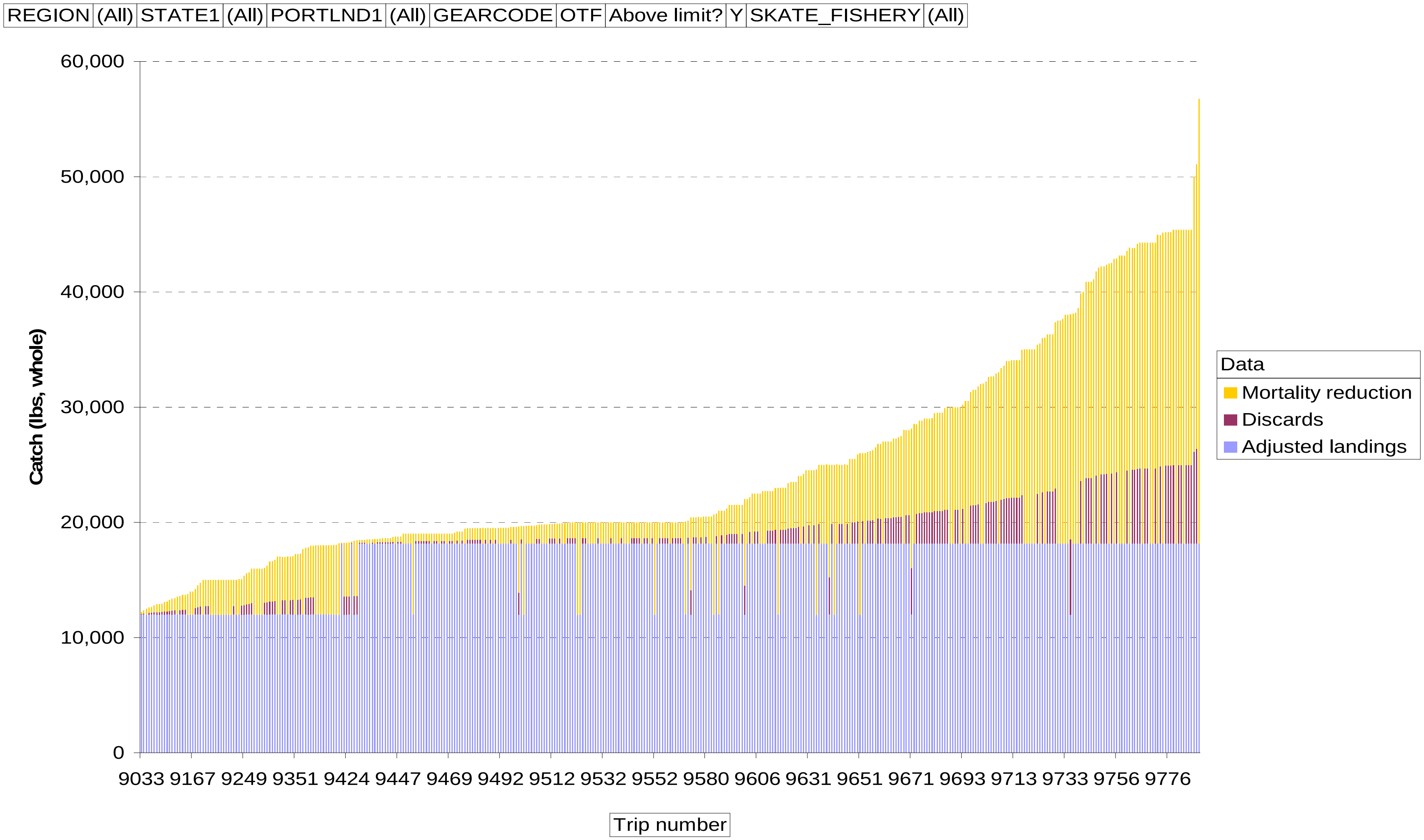


Figure 13. Comparison of revenue from non-skate species and estimated daily cost (fuel, ice, food, supplies + owner share + minimum crew share) for trips that continue fishing after reaching the skate possession limit of 8,000 lbs. of skate wings.

REGION	(All)	STATE1	(All)	PORTLND1	(All)	GEARCODE	OTF	Above limit?	(All)	SKATE_FISHERY	Wings	Strategy2 (0=stop fishing, 1=continue)	1

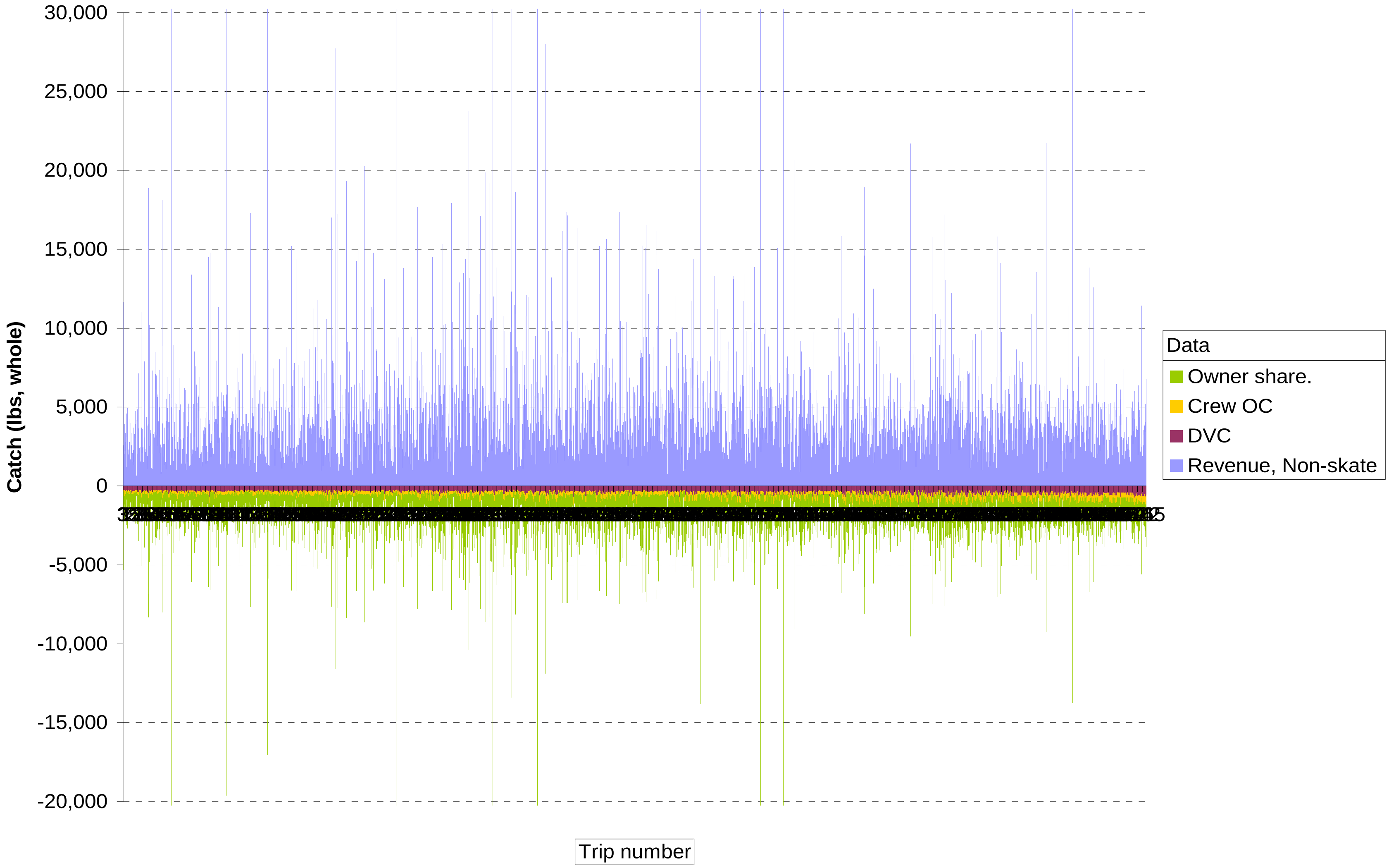


Figure 14. Skate mortality reduction by fishery vs. a skate possession limit, assuming 25 and 50% skate discard mortality. The model assumes that trips do not re-direct on other species or take compensatory trips.

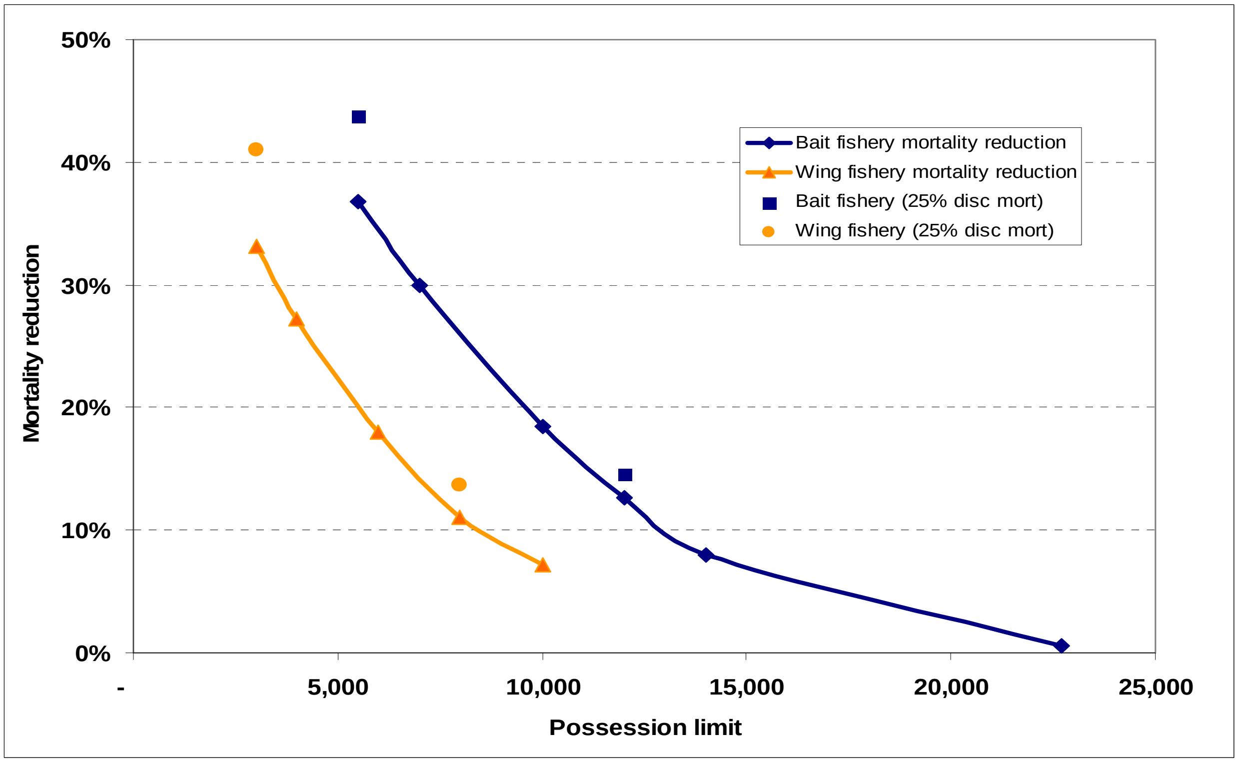


Figure 15. Additional skate discards as a fraction of original landings by fishery vs. a skate possession limit, assuming 50% skate discard mortality. The model assumes that trips do not re-direct on other species or take compensatory trips.

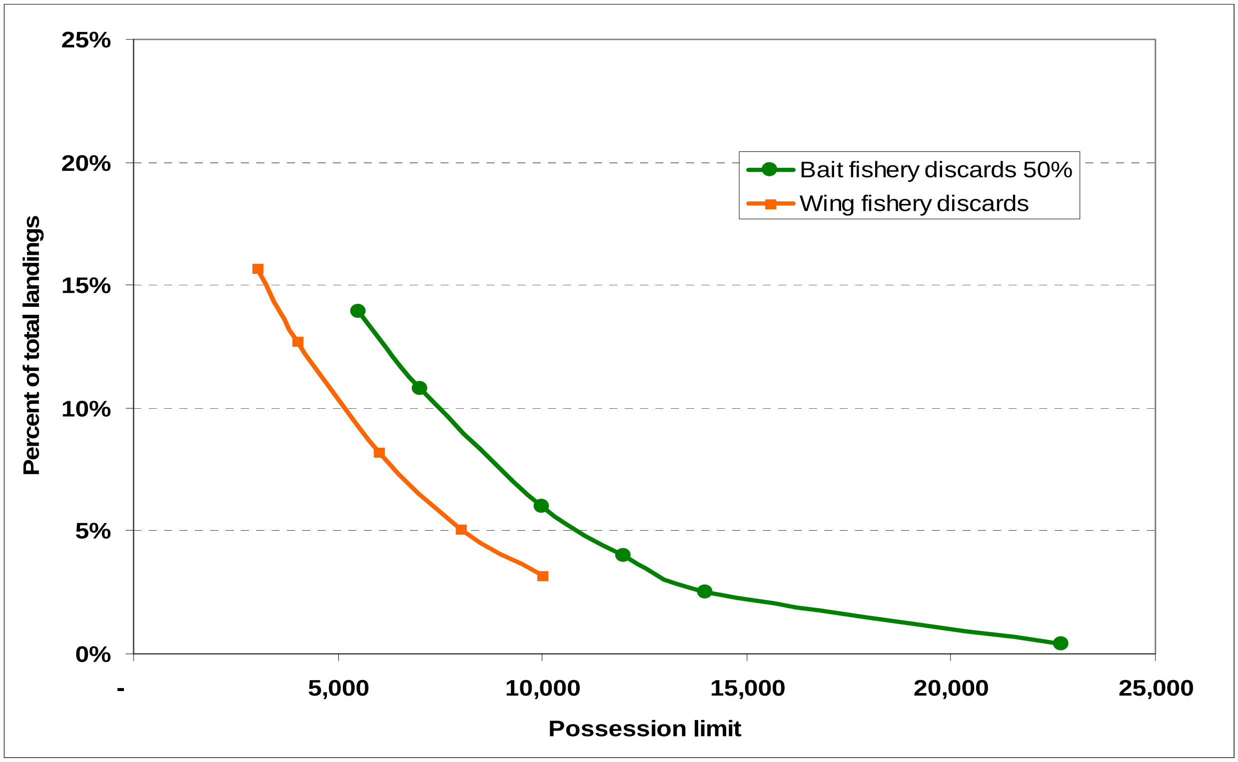


Table 8. Potential responses by vessels to a more restrictive skate possession limit.

1) The vessel is unaffected by the possession limit and fishes as it did before. Landings and discarding remain constant.

2) The vessel is affected by the possession limit and returns to port early when the possession limit is reached. Landings (and discards) are recalculated based on the daily catch rate for each species on the trip. The vessel may take a make up trip if the total time fished on trips landing skates is not exceeded by revised and makeup trips and the trip is profitable. Mortality reduction occurs through lower landings (and discards) of skates.
   a) Trips remain unchanged, but return early when the possession limit is caught.
   b) Trips focus on other species or areas and discard skates
   c) Shorter trips are made more frequently, landing nearly the same amount of skates.

3) The vessel continues to fish as before because the landings of non-skate species exceed the daily fishing cost. Skates are discarded. No makeup trips occur. Mortality reduction occurs through survival of skate discards.

Equation 1. Trip continues if:

$$\left[\sum_{j}^{J} p_j q_j - \sum_{j}^{J} p_j (DA' * LPDA_j)\right] > \left[VC - VC_{DA} * DA' - OC * Crew * DA'\right]$$

Equation 2. Number of DA to reach possession limit:

$$DA' = \frac{TL_i}{LPDA_i}$$

Equation 3. Net return when possession limit is reached:

$$NR^{*}_{TL} = p_i (TL_i) + \sum_{j}^{J} p_j (DA' * LPDA_j) - VC_{DA} * DA'$$

Equation 4. Net return with no possession limit:

$$NR = p_i q_i + \sum_{j}^{J} p_j q_j - VC$$

Equation 5. Net return with possession limit:

$$NR_{TL} = p_i(TL_i) + \sum_{j}^{J} p_j q_j - VC$$

Equation 6. Trawl skate wing fishery combined daily variable fishing costs:

$$DVC = 52.953 + 41.118 * CREW - 0.357 * DA + 7.099 * GRT - 0.258 * HP$$

Equation 7. Trawl whole skate fishery combined daily variable fishing costs:

$$DVC = -304.563 + 38.302 * CREW + 1.856 * DA + 0.509 * GRT + 0.000342 * HoldCap + 1.85 * HP$$

Equation 8. Gillnet whole skate fishery combined daily variable fishing costs:

$$DVC = 232.191 + 10.933 * CREW - 6.598 * DA + 2.332 * GRT - 0.000248 * HoldCap - 0.02 * HP$$

Table 9. Main effects general linear model results for predicting fuel costs.

Fishery	Model	Cost Component	Coefficients	P value	N	Adjusted R2	DW stat	F ratio	P
Trawl wings	5 main effects	Constant	-302.119	0.222	10	0.02[illegible]	0.950	9.250	0.026
		Crew	22.366	0.867					
		DA	16.298	0.706					
		GRT	1.006	0.642					
		Holdcap	[illegible]	[illegible]					
		HP	-0.055	0.045					
	2 main effects	Constant	-20.979	0.922	11	0.4[illegible]	1.019	4.345	0.04
		GRT	7.799	0.123					
		HP	-0.298	0.732					
Trawl whole	5 main effects	Constant	-321.317	0.012	59	0.665	1.516	24.014	0
		Crew	55.311	0.272					
		DA	40.047	0					
		GRT	[illegible]	[illegible]					
		Holdcap	0.001	0.228					
		HP	0.07	0.020					
	2 main effects	Constant	382.247	0.004	62	0.493	1.341	30.344	0
		GRT	0.509	0.555					
		HP	1.362	0					
Gillnet whole	5 main effects	Constant	74.77	0.080	41	0.787	1.833	4.214	0.004
		Crew	7.971	0.506					
		DA	[illegible]	[illegible]					
		GRT	2.703	0.002					
		Holdcap	0	0.209					
		HP	[illegible]	[illegible]					
	2 main effects	Constant	70.566	0.001	49	0.312	1.735	11.379	0
		GRT	2.002	0					
		HP	0.03	0.76					

Table 10. Main effects general linear model results for predicting food costs.

Fishery	Model	Cost Component	Coefficients	P value	N	Adjusted R2	DW stat	F ratio	P
Trawl wings	5 main effects	Constant	-10.001	0.012	10	0.290	1.105	2.192	0.200
		DA	12.06	0.251					
		Holdcap	0	0.533					
		Crew	10.000	0.742					
		GRT	1.717	[illegible]					
		HP	-.003	0.237					
	2 main effects	Constant	-29.001	0.009	12	0.422	1.772	6.020	0.004
		DA	7.248	0.085					
		Crew	41.118	0.016					
Trawl whole	5 main effects	Constant	-73.66	0.192	[illegible]	0.233	2.6	3.576	0.009
		DA	-3.765	0.326					
		Holdcap	0	0.142					
		Crew	24.564	0.006					
		GRT	-0.041	0.35					
		HP	0.06	0.194					
	2 main effects	Constant	36.38	0.172	60	0.308	2.205	11.323	0
		DA	-3.724	0.19					
		Crew	38.02	0					
Gillnet whole	5 main effects	Constant	-16.167	0.449	32	0.03	2.278	1.338	0.258
		DA	-1.054	0.750					
		Holdcap	1	0.546					
		Crew	15.478	0.043					
		GRT	-0.01	0.971					
		HP	[illegible]	0.916					
	2 main effects	Constant	-5.135	0.71	40	0.117	2.139	3.532	0.038
		DA	0.142	0.956					
		Crew	10.363	0.019					

Table 11. Main effects general linear model results for predicting ice costs.

Fishery	Model	Cost Component	Coefficients	P value	N	Adjusted R2	DW stat	F ratio	P
Trawl wings	5 main effects	Constant	57.540	0.024	10	0	2.016	0.755	0.525
		Crew	54.163	0.357					
		DA	-0.168	0.033					
		GRT	2.12	0.170					
		Holdcap	1	[illegible]					
		HP	-0.177	0.618					
	2 main effects	Constant	30.004	0.557	11	0	2.710	0.750	0.490
		DA	6.391	[illegible]					
		Holdcap	0	0.053					
Trawl whole	5 main effects	Constant	-63.967	[illegible]	39	0.304	1.846	4.375	0.004
		Crew	13.577	0.134					
		DA	2.000	0.049					
		GRT	0.219	[illegible]					
		Holdcap	0	0.323					
		HP	0.102	0.7					
	2 main effects	Constant	[illegible]	0.917	41	0.163	1.851	4.39	0.013
		DA	5.58	0.024					
		Holdcap	0	0.021					
Gillnet whole	5 main effects	Constant	78.364	0.112	29	0.143	1.956	1.733	0.178
		Crew	0.300	0.914					
		DA	[illegible]	0.348					
		GRT	0.37	0.229					
		Holdcap	0	0.029					
		HP	[illegible]	[illegible]					
	2 main effects	Constant	23.55	0	30	0.153	1.932	3.75	0.037
		DA	0.406	0.006					
		Holdcap	0	0.033					

Table 12. Main effects general linear model results for predicting miscellaneous (supplies & gear damage) costs

Fishery	Model	Cost Component	Coefficients	P value	N	Adjusted R2	DW stat	F ratio	P
Trawl wings	5 main effects	Constant	245.004	0.156	7	0.027	1.012	6.706	0.304
		Crew	[illegible]	[illegible]					
		DA	-30.166	0.144					
		GRT	6.570	0.127					
		Holdcap	0	0.434					
		HP	-0.303	0.125					
Trawl whole	5 main effects	Constant	65.366	0.578	41	0	1.936	0.373	0.509
		Crew	-0.534	0.032					
		DA	22.524	0.100					
		GRT	1.140	0.316					
		Holdcap	0.001	0.136					
		HP	0.166	0.614					
Gillnet whole	5 main effects	Constant	-115.366	0.252	40	0.103	1.633	2.330	0.066
		Crew	07.40	0.007					
		DA	[illegible]	0.376					
		GRT	-2.216	0.237					
		Holdcap	-0.001	0.144					
		HP	0.03	0.978					

Table 13. Main effects general linear model results for predicting aggregate fishing costs

Fishery	Model	Cost Component	Coefficients	P value	N	Adjusted R2	DW stat	F ratio	P
Trawl wings	5 main effects	Constant	-402.004	0.299	10	0.702	1.199	7.45	0.007
		Crew	[illegible]	[illegible]					
		DA	[illegible]	0.031					
		GRT	7.406	0.130					
		Holdcap	[illegible]	0.072					
		HP	-0.394	0.719					
Trawl whole	5 main effects	Constant	[illegible]	0.029	59	0.845	[illegible]	[illegible]	0
		Crew	105.38	0.154					
		DA	[illegible]	0					
		GRT	[illegible]	[illegible]					
		Holdcap	[illegible]	0.035					
		HP	[illegible]	0.132					
Gillnet whole	5 main effects	Constant	[illegible]	[illegible]	41	[illegible]	[illegible]	[illegible]	[illegible]
		Crew	110.021	[illegible]					
		DA	[illegible]	[illegible]					
		GRT	0.516	0.8					
		Holdcap	-0.002	0.040					
		HP	[illegible]	0.858					

Figure 16. Components of daily variable cost by fishery and average vessel characteristics in 2006 sea sampling data for trips landing one or more pounds of skates.

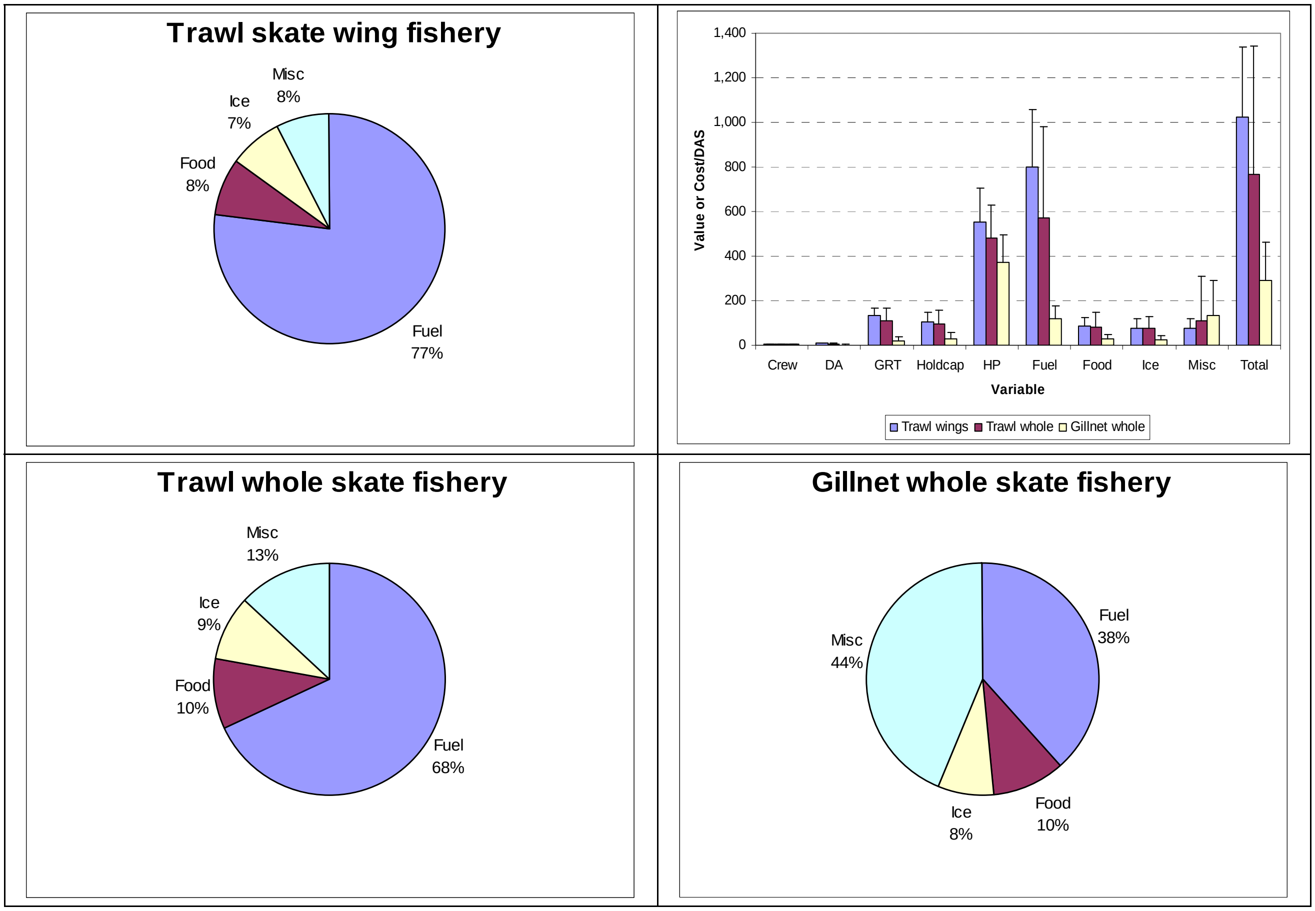


Figure 17. Correlation between dependent variables for observed trips, by fishery and gear (OT=trawl,GG=gillnet)

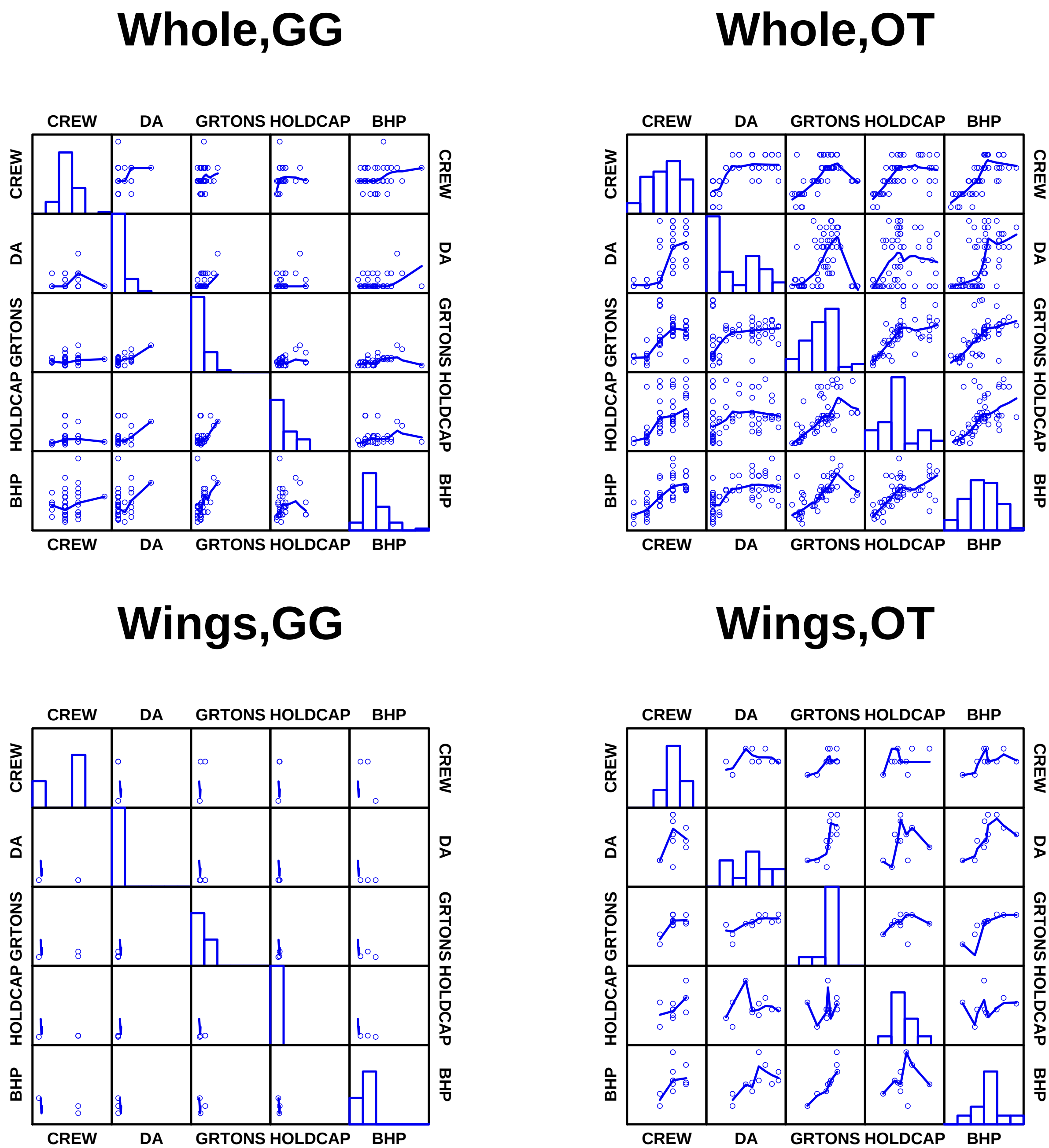


Figure 18. Daily variable fishing costs vs. vessel characteristics for trawl vessels landing skate wings on observed trips.

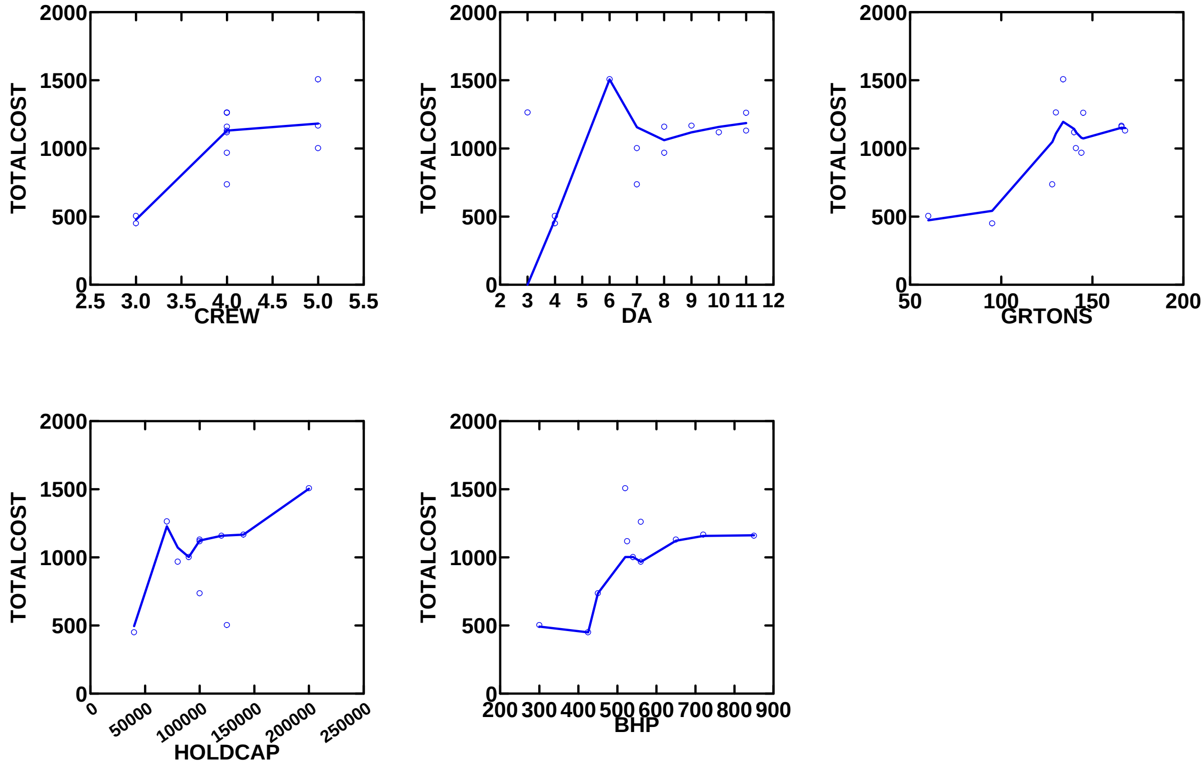


Figure 19. Daily variable fishing costs vs. vessel characteristics for trawl vessels landing whole skates on observed trips.

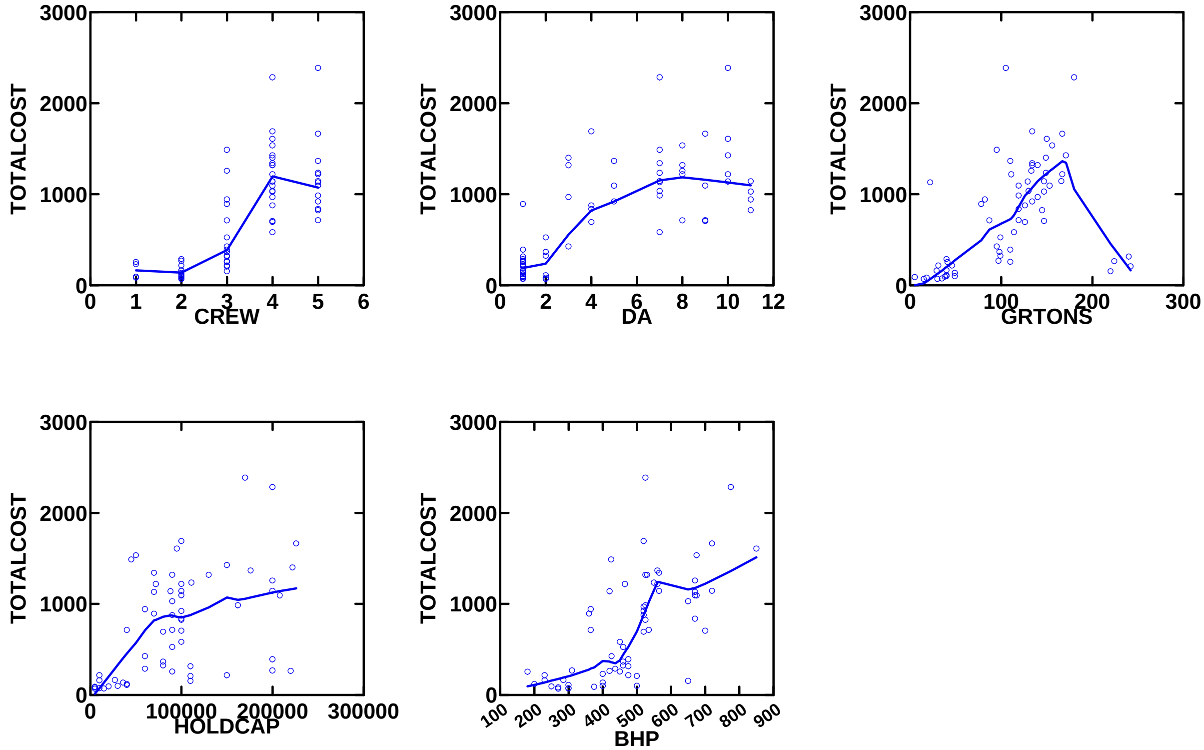


Figure 20. Daily variable fishing costs vs. vessel characteristics for gillnet vessels landing whole skates on observed trips.

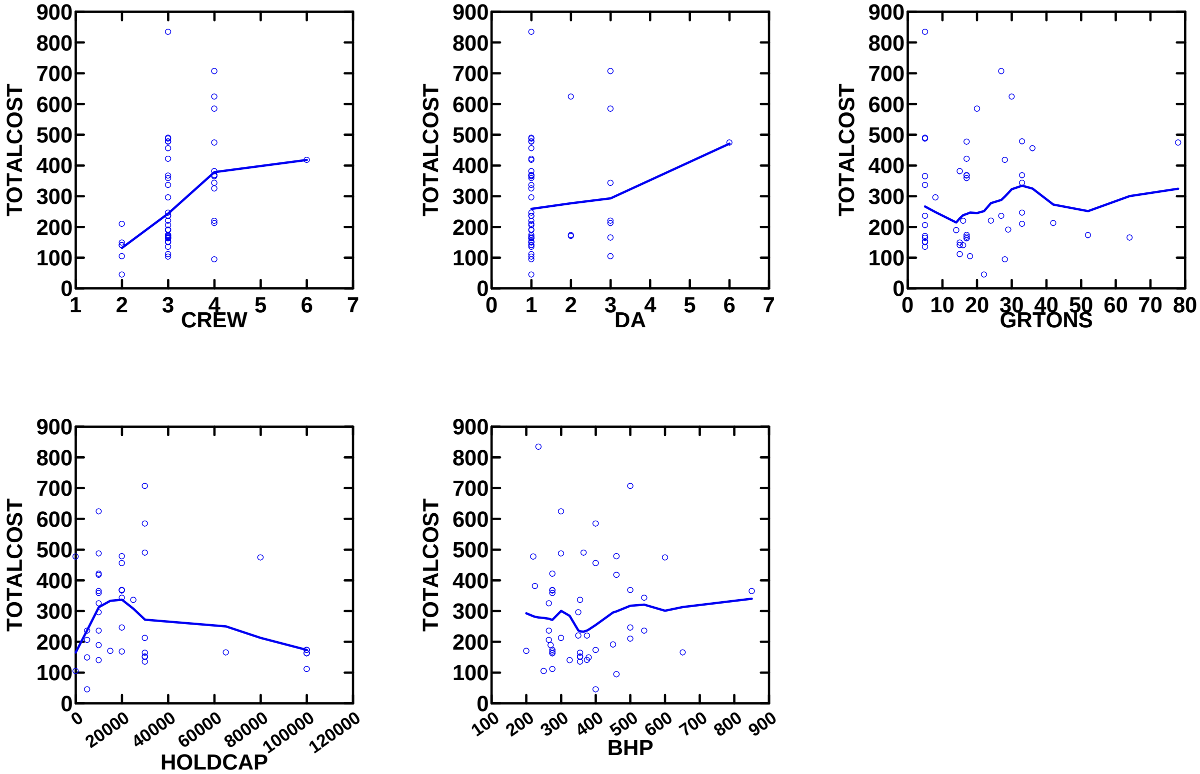
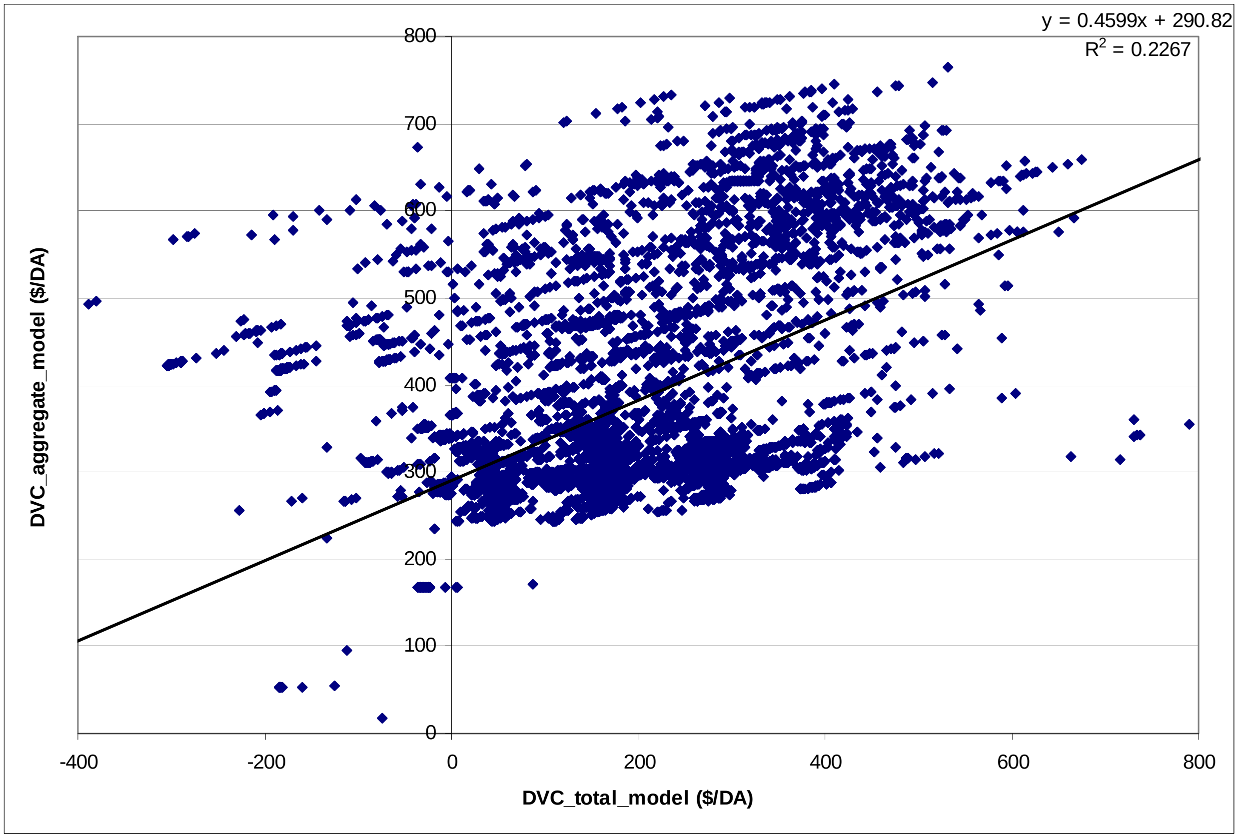


Figure 21. Comparison between GLM for component daily variable fishing costs and a GLM for total daily variable fishing costs.



13. Document 13

Analysis of wing and whole skate fishery possession limits to achieve Amendment 3 TALs

Applegate 2008

New England Fishery Management Council
50 WATER STREET | NEWBURYPORT, MASSACHUSETTS 01950 | PHONE 978 465 0492 | FAX 978 465 3116
John Pappalardo, *Chairman* | Paul J. Howard, *Executive Director*

MEMORANDUM

DATE: **May 28, 2008**

TO: **Skate Oversight Committee**

FROM: Skate PDT

SUBJECT: **Analysis of wing and whole skate fishery possession limits to achieve Amendment 3 TALs**

The Scallop Oversight Committee requested a supplemental PDT analysis of skate possession limits to achieve the Amendment 3 total allowable landings (TALs) for the wing and whole/bait fisheries. The supplemental request asked for separate skate possession limits to be calculated, achieving the same target mortality reductions as shown in Table 1 of the May 12, 2008 PDT report.

Model treatment of the 2007 VTR data was modified to subdivide trips landing skate wings into two components, trips whose duration (dateland – datesail) was less than 24 hours (presumed to be day boats), and trips whose duration was longer than 24 hours (presumed to be trip boats). Mortality reductions (after accounting for discard mortality on trips that would continue fishing for other species, despite a lower skate possession limit) were calculated over a range of skate possession limits that yielded mortality reductions between about 10 and 40 percent.

The results are shown in Figure 1, with an example showing the possession limits in each fishery that would achieve a 21.4 percent reduction in mortality. This objective (the same as an alternative with time/area closures and a landings allocation based on the proportion of landings in each fishery during 2005-2007) was met with a 4,200 lbs. (9,534 lbs. live weight) possession limit applying to day boat trips landing skate wings and a 6,400 lbs. (14,528 lbs. live weight) possession limit applying to trip boat trips landing skate wings. A possession limit of 8,500 lbs. of whole skates would achieve the same mortality reduction in the whole/bait skate fishery, but the Amendment 3 mortality reduction objectives for the whole/bait skate fishery are shown in Table 1.

Skate possession limits for Amendment 3 alternatives are shown in Table 1. Skate possession limits for the day boat vessels were calculated to achieve the same proportional reduction in landings when they were approximately 67-72% of those for the trip boat vessels. If Amendment 3 includes separate possession limits for the day boat fishery, it could, depending on the possession limits and operational costs, induce vessels that customarily take longer trips to take shorter, more frequent trips under day boat rules.

Figure 22. Estimated skate mortality reduction by skate fishery and trip length calculated by applying the possession limits to 2007 VTR trips. Skate discard mortality was assumed to be 50% on trips that continue to fish for other species. Example trip limits are indicated that would achieve a 21.4% mortality reduction in each fishery component.

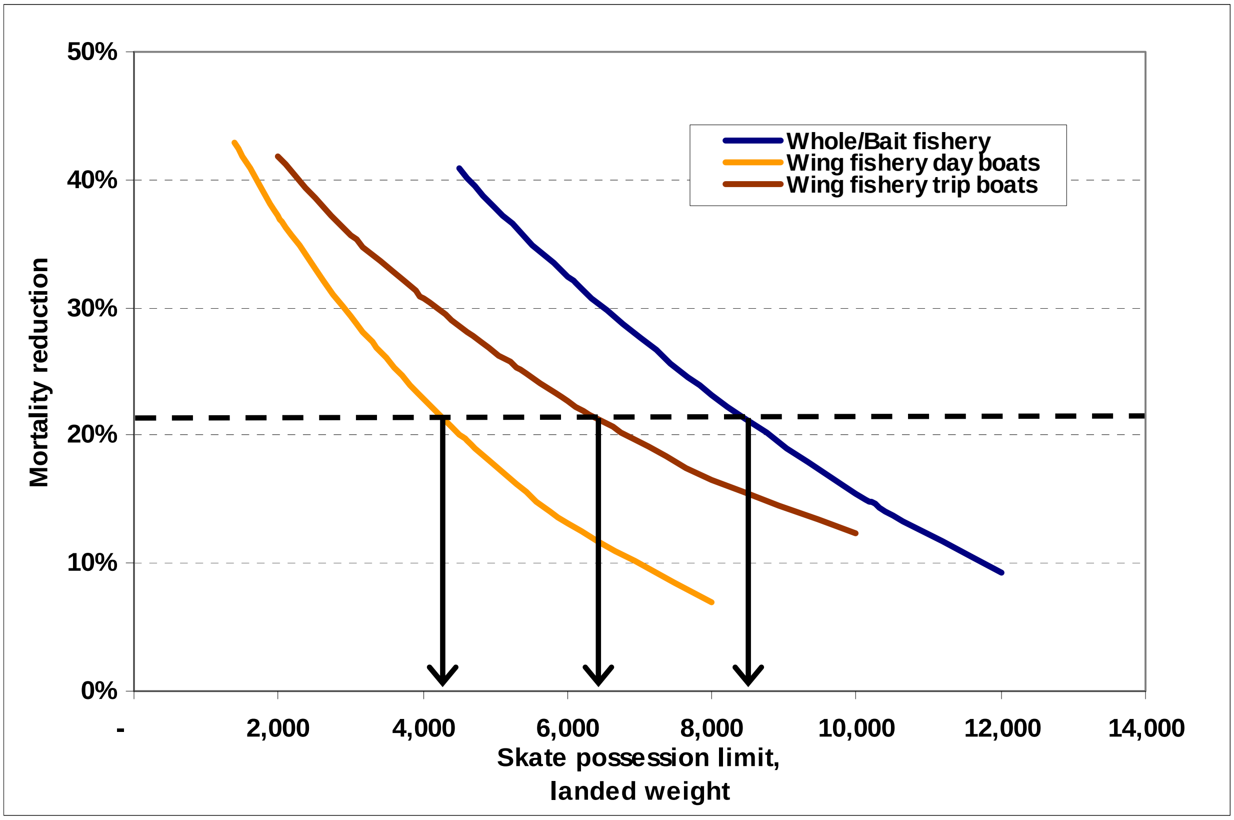


Table 14. Estimated skate possession limits to achieve target catches by skate fishery.

			Wing fishery day boats		Wing fishery trip boats		Whole/bait fishery	
Whole/wing allocation basis	Time/area closures	Landed mortality reduction target	Possession limit (wings)	Live weight	Possession limit (wings)	Live weight	Landed mortality reduction target	Possession limit
2005-2007 allocation	Possession limit only	36.5%	2,100	4,767	2,900	6,583	31.5%	6,200
	Time area with 500 lbs. incidental	21.1%	4,200	9,534	6,400	14,528	36.2%	5,300
	Gear restricted areas	19.3%	4,600	10,442	6,900	15,663	31.5%	6,200
1995-2006 allocation	Possession limit only	41.9%	1,400	3,178	2,000	4,540	13.8%	10,500
	Time area with 500 lbs. incidental	27.1%	3,300	7,491	4,800	10,896	18.4%	9,200
	Gear restricted areas	25.1%	3,600	8,172	5,300	12,031	13.4%	10,600

14. Document 14

Smooth skate rebuilding potential and rebuilding plan

MEMORANDUM

DATE: **July 30, 2008**

TO: Skate Oversight Committee

FROM: Skate PDT

SUBJECT: **Smooth skate rebuilding potential and rebuilding plan**

This month the Council received notice that based on 2007 trawl survey data, smooth skate has become overfished (i.e. below the minimum biomass target of 0.16 kg/tow) and thorny skate was experiencing overfishing (i.e. the decline in the three year moving average for biomass was greater than 20%). In response, the PDT evaluated the rebuilding potential for smooth skate using available life history and survey information. It also evaluated the likelihood that Amendment 3 alternatives would address thorny skate overfishing and initiate smooth skate rebuilding.

Based on this analysis, the PDT found that to rebuild smooth skate within 6-10 years would require a minimum intrinsic rate of population growth of 0.1 to 0.2. Although critical information on survival and fecundity are missing, the PDTs best estimate of the maximum intrinsic rate (i.e. an average population growth rate with no fishing) of population growth for smooth skate is 0.20 (range 0.00 to 0.35). The PDT notes that when skate catch was below the median, smooth skate biomass increased 8 of the 11 years in the time series, with an average 37% annual increase in biomass. Based on this information rebuilding to the biomass target (0.31 kg/tow) within 10 years is possible.

Although the three year moving average for biomass declined below the threshold, smooth skate abundance has exhibited increases in abundance (0.12/yr) since the late 1990s, but abundance trends have been flat in the fall survey (0.00/yr). The Skate FMP prohibits landings of smooth and thorny skates and there is very little skate fishing that presently occurs in the Gulf of Maine. Furthermore, with catch limits set at or below the median for the time series, Amendment 3 is likely to provide sufficient conservation of smooth skate to initiate or continue smooth skate rebuilding. There is also potential conservation that could be realized through existing or planned regulations for the groundfish and monkfish FMPs. Skate discard estimates for 2007 are however unavailable, which could show the effects of Framework 42 on skate catches. But it is presently unclear what alternatives will emerge from Amendment 16 or how they may affect skate catches.

Nevertheless, the Skate PDT recommends consideration of measures to reduce skate bycatch in other fisheries. Implementing measures to reduce bycatch in the Gulf of Maine would provide conservation benefits for smooth and thorny skate (which are distributed primarily in the Gulf of Maine). An expansion of the required use of the haddock rope (“eliminator”) trawl in the Gulf of Maine would provide this conservation benefit to skates (see Beutel et al. and Council analysis URL=).

Although gear restricted areas (GRAs) were not included as a measure in Amendment 3 alternatives, additional analysis may identify well-defined areas where a reduction of fishing with gears capable of catching skates could have significant conservation benefits for overfished skates. It may be worthy of re-consideration of GRAs in future skate actions, particularly after the data poor assessment workshop has concluded and when the Council will hopefully have a better understanding of skate population dynamics.

Results

Leslie matrix demographic analysis for smooth skate

- Limited information is available on the life history of the smooth skate, with no information on fecundity, first year survival, or egg survival.

- Natural mortality was estimated indirectly from maximum age, age-at-maturity, and the von Bertalanffy growth parameter (Table 1).

Table 1.

	Smooth Skate Natural Mortality Estimates			
Method:	Hoenig	Pauly	Jensen	Jensen
Parameters used:	Max. age	K, Linf, Water temp	(tmat)	(K)
Estimates:	0.167	0.199	0.183	0.180

- There is not enough information from the survey indices to provide clear population trends and annual rates of increase that could be used to gain insights and narrow estimates for the unknown life history parameters. Thus, a sensitivity analysis was conducted over a reasonable range of input values.

- The base case scenario (first line in table) predicts a population growth rate of 0.2 yr^{-1} but given the uncertainty in the inputs estimates could range from 0 (clearly infeasible but without additional information it is impossible to determine which input parameters are in error), to a maximum of 0.35 yr^{-1}.

- If the observed growth of 0.12 yr-1 in the spring survey is valid (see Survey Trends below) and not simply a result of noisy data then the maximum population growth rate is bound from 0.12 to 0.35. Thus the base case model result of 0.2 seems very reasonable but difficult to support given the limited information.

Population trends of smooth skate from the NEFSC annual surveys

- Survey data is extremely noisy and shows no evidence of a declining population since the mid 1990's (Figures 1).

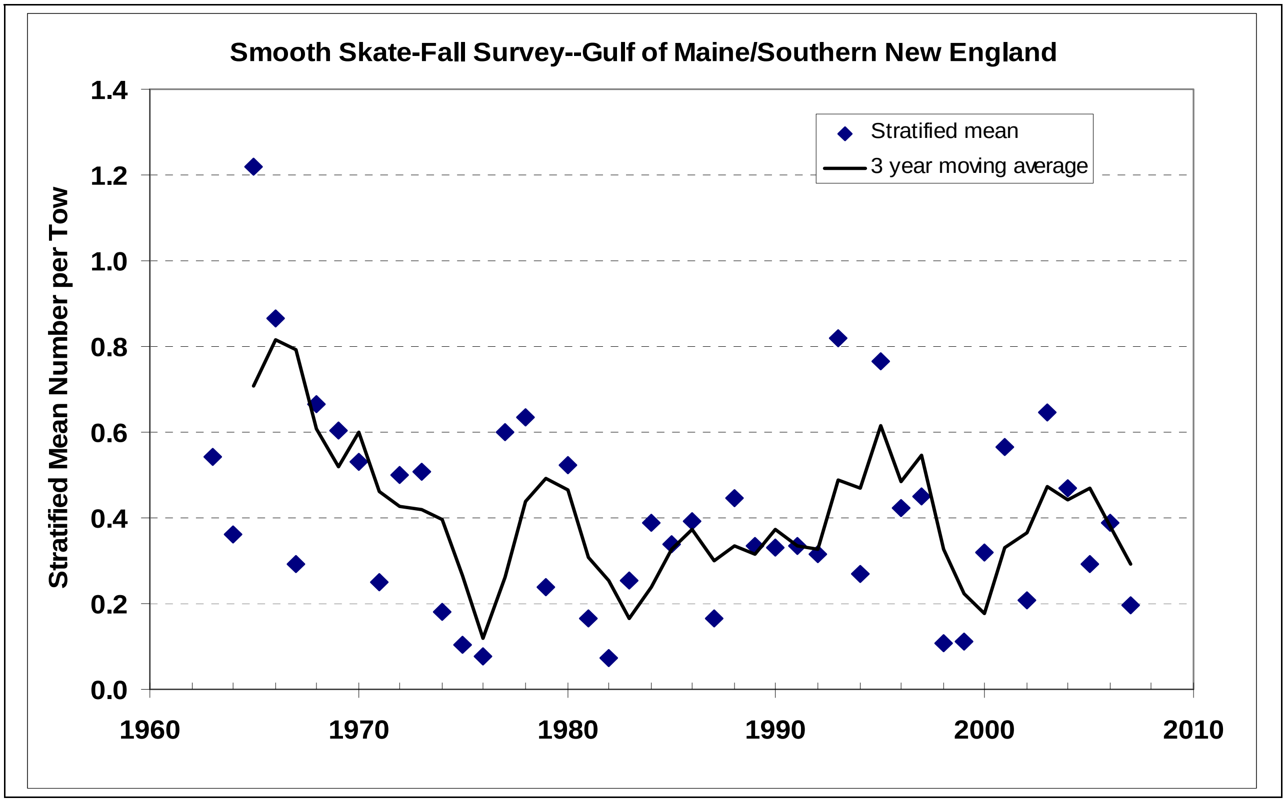
- The fall survey shows some evidence that population may have declined in the late 1960's but the values are highly variable and there is no evidence for either a declining or increasing abundance. A linear fit to log transformed values suggests the population has been stable (-0.007 yr^{-1}) since 1994.

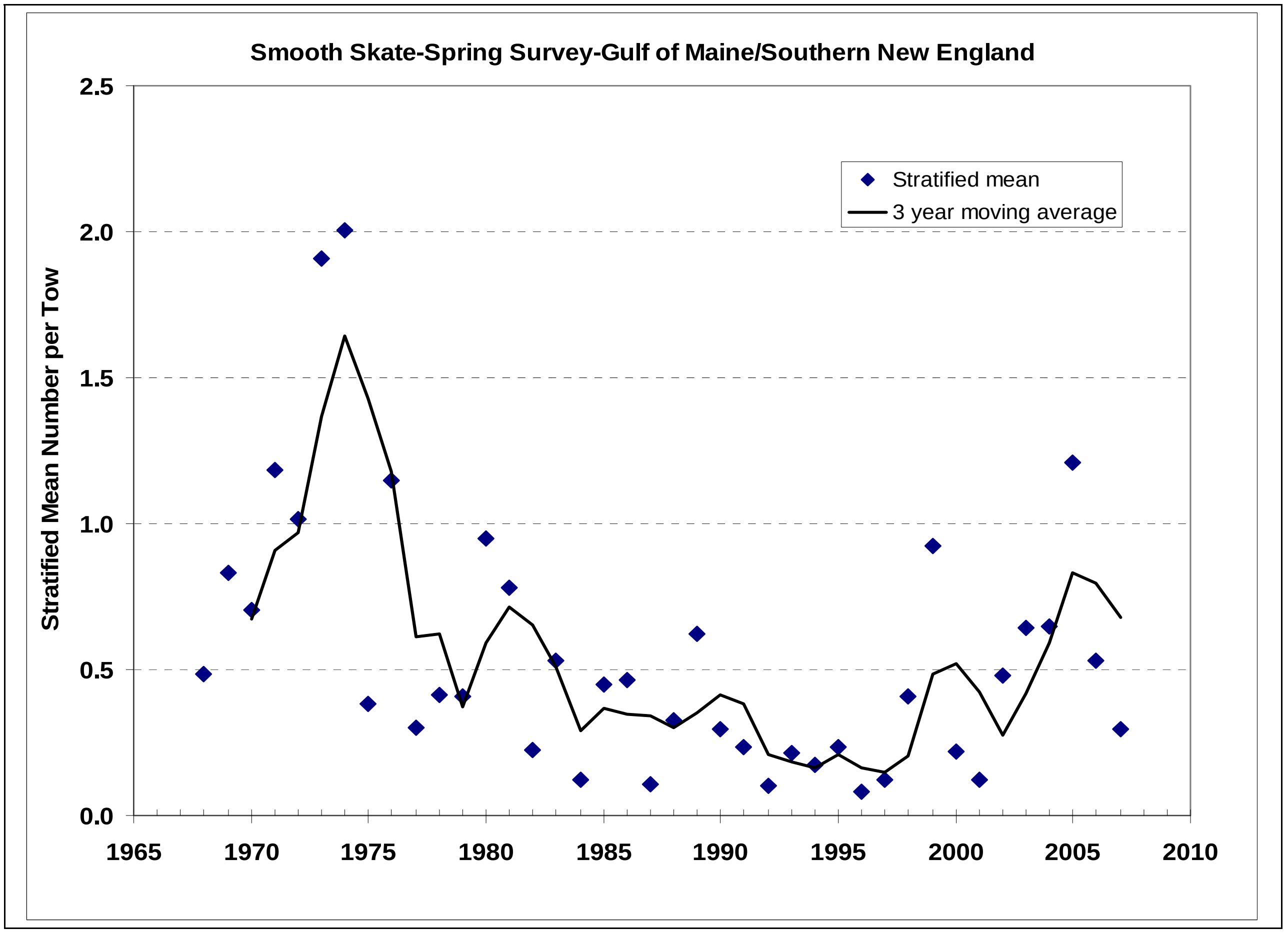
- The spring survey appears to have a slightly greater catchability for smooth skate than the fall survey (mean of 0.57 versus 0.41 per tow for the entire time series, respectively) but values are also highly variable.

- A log transformation of the spring indices indicates that the population was in decline until the early 1990's with an apparent recovery occurring since around 1994. This would correspond to the timing of the Georges Bank closed areas.

- Since 1994, the spring survey data indicates that the population has been growing at a rate of around 0.12 yr^{-1}.

Figure 23. NMFS trawl survey indices of smooth skate abundance for the autumn survey (top) and spring survey (bottom).





Smooth Skate-Spring Survey-Gulf of Maine/Southern New England
Stratified mean
3 year moving average
Stratified Mean Number per Tow
2.5
2.0
1.5
1.0
0.5
0.0
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010

15. Document 15

Port Profiles

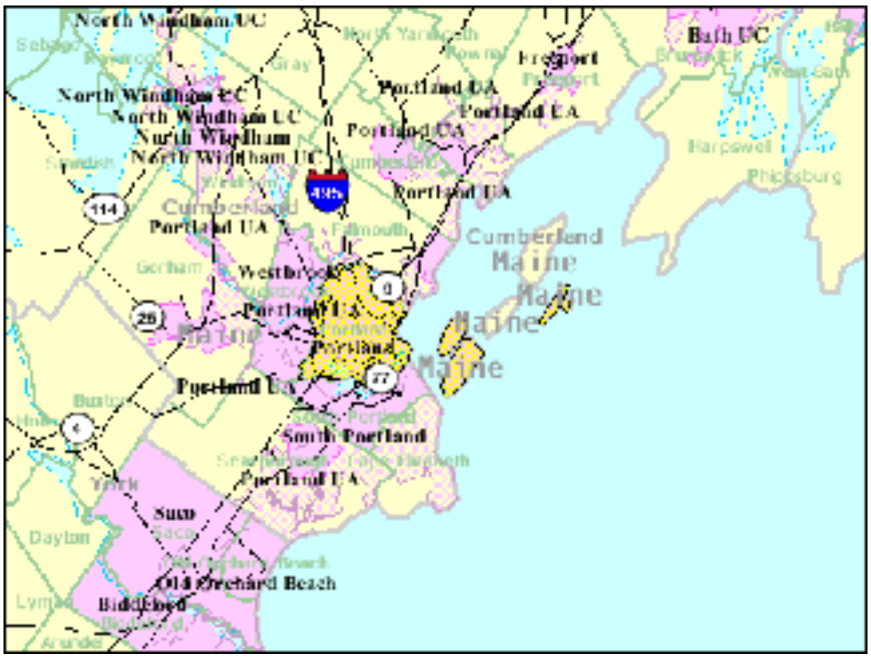
a. PORTLAND, ME[7]

Community Profile[8]

People and Places

Regional orientation

The city of Portland, Maine (43.66 N, 70.2 W) has 56.92 miles of coastline (Sheehan and Copperthwaite 2002), a terrestrial area of 54.9 square miles, and 31.4 square miles of water. It is located in Cumberland County on Casco Bay, and is adjacent to South Portland, Westbrook, and Falmouth. Portsmouth and Manchester, New Hampshire are the closest large cities (MapQuest 2006). **Portland** is the largest city in Maine and has the highest population in New England north of Boston.



Map 1. Location of Portland City, ME (US Census Bureau 2000)

i.Historical/Background

Prior to English settlement in 1632, resident Native Americans referred to this region as *Machigonne*, meaning “Great Neck.” This fishing and trading settlement changed names several times before it became Portland in 1786. The city was destroyed four times by various sources including Native American attacks, the British Navy during the American Revolution, and a fire. Each time it was rebuilt and now it is well-known for its preservation of Victorian-style architecture.

The city’s port industries have driven its economy since its settlement. From the mid-1800s until World War I, Portland provided the only port for Montreal, Canada. Railroads from the south to the north fed through the

7 These community profiles have been created to serve as port descriptions in Environmental Impact Statements (EISs) for fisheries management actions. They also provide baseline information from which to begin research for Social Impact Assessments (SIAs). Further, they provide information relevant to general community impacts for National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and information on minorities and low income populations for Executive Order (E.O.) 12898 on Environmental Justice.

8 For purposes of citation please use the following template: “Community Profile of *Town, ST*. Prepared under the auspices of the National Marine Fisheries Service, Northeast Fisheries Science Center. For further information contact Lisa.L.Colburn@noaa.gov.”

city, facilitating trade and travel. Although Canada developed its own ports, and other cities in southern New England states built larger ports, the city remained tied to its maritime roots by depending on the fishing industry. More recently, it has become a popular cruise ship destination. Although tourism plays a major role in the city's economy, Portland functions as the second largest oil port on the east coast of the U.S., and as valuable fishing port (Monroe, no date). For a more detailed history of Portland and the surrounding fishing communities, refer to Hall Arber et al. (2001).

ii. Demographics[9]

According to Census 2000 data[10], Portland City has a total population of 64,257, down 0.2% from a reported population of 64,358 in 1990 (US Census Bureau 1990). Of this 2000 total, 47.9% were males and 52.1% were female. The median age was 35.7 years and 77.4% of the population was 21 years or older, while 15.7% of the population was 62 or older.

Portland's age structure (see Figure 1) varies from smaller fishing cities in that the age groups with the highest population in Portland were 20-29 years, 30-39 years and 40-49, while smaller fishing towns often had a much lower portion of its population between 20-29 years and higher between 0-19 years than Portland. This difference in age structure may be because Portland offers employment opportunities to 20-29 year olds (recent high school or college graduates) that smaller cities or rural towns cannot offer, especially in Maine.

The majority of the population was white (91.1%), with 2.6% black or African American, 3.1% Asian, 0.5% Native American, and 0.1% Pacific Islander or Native Hawaiian (see Figure 2). Only 1.5% of the population identified themselves as Hispanic/Latino (see Figure 3). Residents linked their backgrounds to a number of different ancestries including: English (19.2%), French (10.5%), French Canadian (4.9%), German (6.9%) and Irish (21.2%). With regard to region of birth, 59.1% of residents were born in Maine, 32.4% were born in a different state and 7.6% were born outside the U.S. (including 5.0% who were not US citizens).

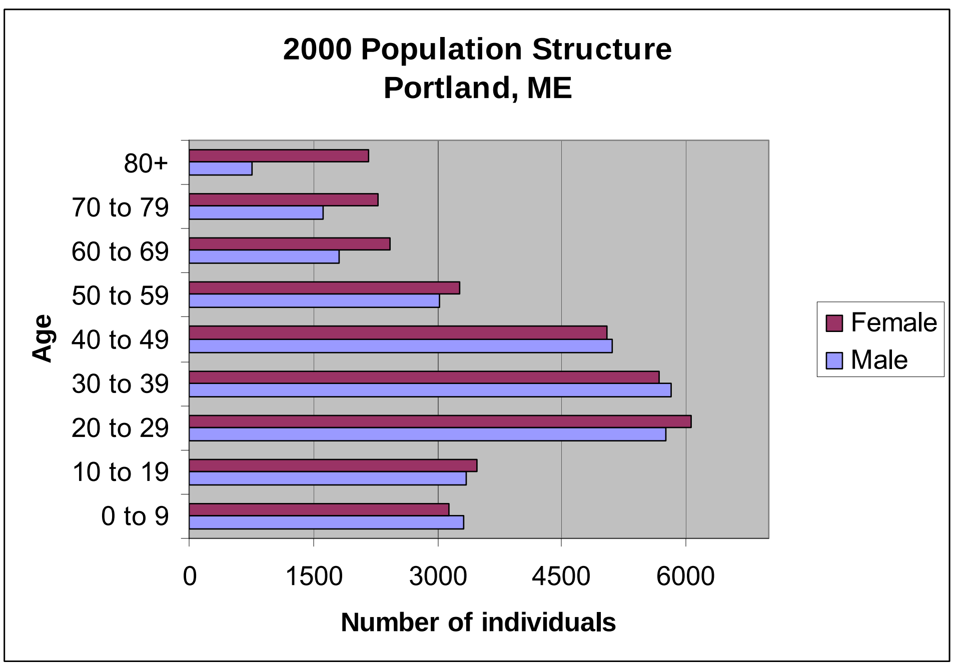


Figure 1. Portland's population structure by sex in 2000 (US Census Bureau 2000)

9 While mid-term estimates are available for some larger communities, data from the 2000 Census are the only data universally available for the communities being profiled in the Northeast. Thus for cross-comparability we have used 2000 data even though these data may have changed significantly since 2000 for at least some communities.
10 These and all census data, unless otherwise referenced, can be found at U.S. Census: American Factfinder 2000 http://factfinder.census.gov/home/saff/main.html; census data used are for Portland City, Maine

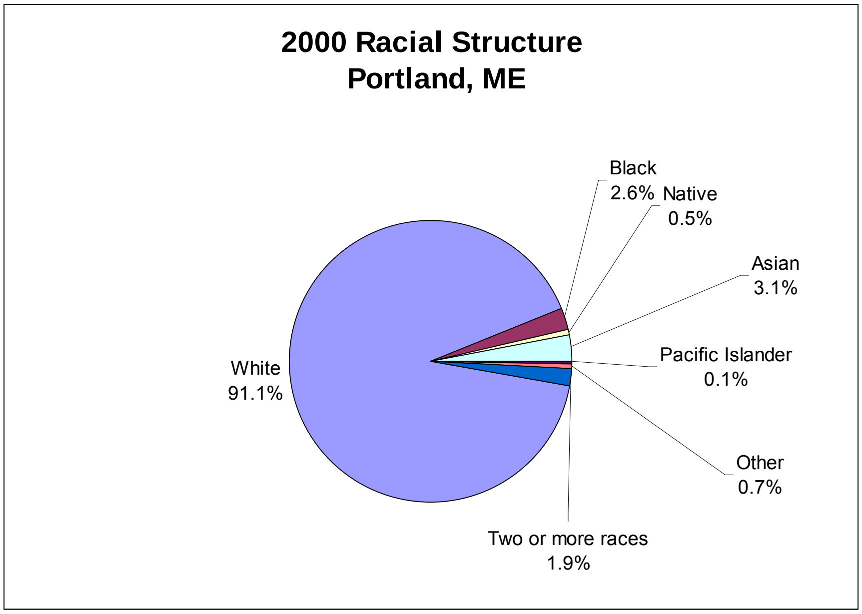


Figure 2. Racial Structure in 2000 (US Census Bureau 2000)

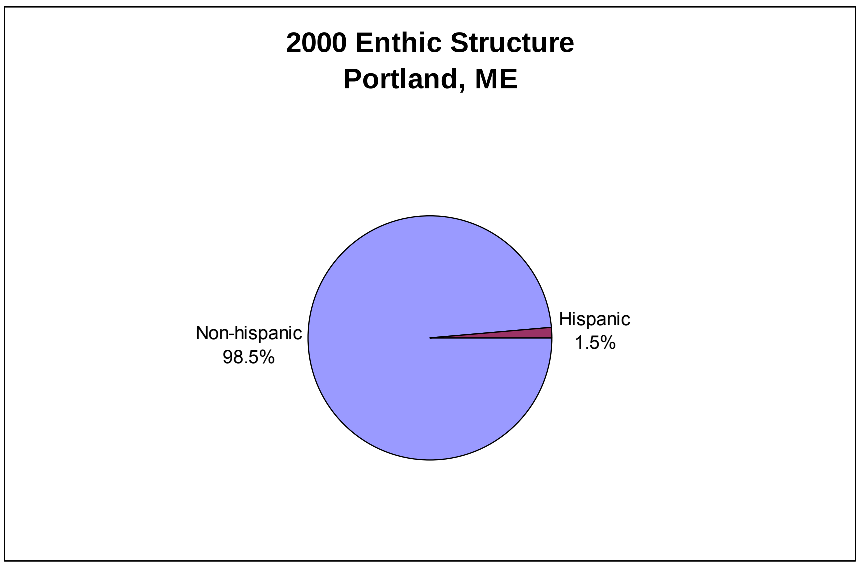


Figure 3. Ethnic Structure in 2000 (US Census Bureau 2000)

For 90.1% of the population, only English was spoken in the home, leaving 9.9% in homes where a language other than English was spoken, including 3.8% of the population who spoke English less than "very well" according to the 2000 Census.

Of the population 25 years and over, 88.3% were high school graduates or higher and 36.4% had a bachelor's degree or higher. Again of the population 25 years and over, 4.3% did not reach ninth grade, 7.5% attended some high school but did not graduate, 25.9% completed high school, 19.3% had some college with no degree, 6.7% received their associate's degree, 23.4% earned their bachelor's degree, and 13% received either their graduate or professional degree.

Although religion percentages are not available through U.S. Census data, according to the Association of Religion Data Archives (ARDA) in 2000, the religion with the highest number of congregations in the metro area of Portland was the United Church of Christ with 33 congregations and 10,160 adherents. Other prominent congregations in the county were Catholic (31 with 61,495 adherents), United Methodist (26 with 5,690 adherents), Baptist (15 with 2,446 adherents), and Episcopal (11 with 4,577 adherents). The total number of adherents to any religion was up 24.6% from 1990 (ARDA 2000).

Issues/Processes

Media attention has focused on the impacts of Amendment 13 on the fishermen of Portland and surrounding fishing communities. Amendment 13 limited fishermen's Days at Sea throughout the Northeast, but Maine fishermen feel they were put at more of a disadvantage than Southern New England because Maine is farther from George's Bank, which requires fishermen to use more of their allowed Days at Sea for travel rather than fishing.

Another issue in newspapers during this same time period is the question of how Portland's land-based fishing industry infrastructure will remain in business if landings become more sporadic. For example, if the Portland Fish Exchange were to go out of business, fishermen would have to travel to other large ports to sell their landings. To avoid this disaster, the federal government implemented a program to keep the Fish Exchange afloat during the current strict groundfish regulations.

The main issue of worry for the fishing community in Portland and other towns in Maine is whether the fishing infrastructure can be maintained as Days at Sea and catches are limited. Most recently, there has been concern that herring fishing is threatening groundfish stocks (Hench 2004).

There is a current (late 2007) request for proposals out to developers to redevelop the Maine State Pier. This facility is owned by the city and was recently rezoned to allow uses outside the strict marine uses allowed in the rest of the Central Waterfront Zone. Two developers have submitted bids that would preserve a 1000-foot berthing space for ships, existing public access, three windjammer charter boats and the bay's ferry terminal (Casco Bay Lines). The City is still trying to select a developer for this venture.11

In 2006, the State of Maine passed the Working Waterfront Tax Law, to address the problem of working waterfront property being heavily taxed based on its projected market value. The goal of this tax is "to encourage the preservation of working waterfront land and to prevent the conversion of working waterfront land to other uses as the result of economic pressures caused by the assessment of that land for purposes of property taxation." The law requires the tax assessor to value the property based on what it is worth as working waterfront land, rather than what its market value would be if it were sold and converted to residential or other uses (State of Maine 2005).
The main skate issue in Portland is that Sea Fresh needs a minimum of about 10,000lbs/day to maintain its skate processing division, preferably 20-30,000lbs/day. Management there is concerned about any measures that drastically reduce landings or create derbies and then down times. Low trip limits makes skate a boutique item and eliminates possibility of larger production runs. If they cut skate processing they also lose specialty cutters, though less so than some other companies as they process a number of species.12

Cultural attributes

In 2004, Portland's annual Blessing of the Fleet, coordinated by the Maine Fishermen's Wives Association13 and the Seafarer's Friends Society, was celebrated in mid-June.

Infrastructure

iii.Current Economy

Portland's waterfront provides most of the community's fishing industry infrastructure (e.g., Portland Fish Exchange). However, it also is the site of many other industries: recreation, tourism, light industry, transportation, cargo, and marine-related research, many of which compete for space with the fishing industry (State of Maine/City of Portland, no date). Cianbro, a major construction company from northern Maine, recently developed a permanent facility on Portland's waterfront where two ships are currently being refitted to become sulfur carrying vessels.14 Potential additions to the waterfront property include the additions of commercial businesses or strengthening the current fishing industry infrastructure so that it can deal with predicted increases in groundfish stocks (Portland Press Herald 2004).

As of 2007 Sea Fresh USA had a processing plant here handling a variety of species, including skate. They buy directly from vessels in Maine, Rhode Island, and Massachusetts, and from offloaders and auctions throughout

11 Profile review comment, Jon Kachmar, Chair of Harbor Commission, October 18, 2007

12 Pers. comm. from Larry Lindgren of the Portland plant of Sea Fresh USA, October 24, 2008.

13 Contact information: 207.729.5739

14 Profile review comment, Jon Kachmar, Chair of Harbor Commission, October 18, 2007

the region. They have to buy from multiple locations because they can't get the 20-30,000lbs a day they want in one place. They regularly buy from approximately 10-16 vessels in RI, 20 in New Bedford, about 6 on Cape Cod, and 15 located from Gloucester to Portland.

According to the U.S. Census 2000[15], 70.1% (15,266 individuals) of the total population 16 years of age and over were in the labor force (see Figure 4), of which 3.3% were unemployed, 0.1% were in the Armed Forces, and 65.7% were employed.

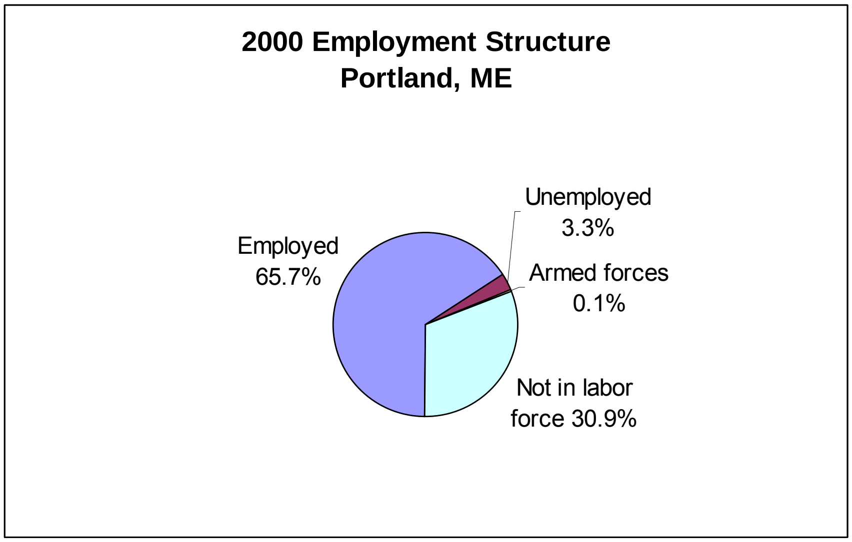


Figure 4. Employment structure in 2000 (US Census Bureau 2000)

According to Census 2000 data, jobs which in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 144 positions or 0.4% of all jobs. Self employed workers, a category where fishermen might be found, accounted for 2,512 positions or 7.1% of jobs. Educational, health and social services (21.8%), retail trade (13.5%), professional, scientific, management, administrative, and waste management services (11.2%), and finance, insurance, real estate, and rental and leasing (10.6%) were the primary industries.

The major employers of Portland include: Maine Medical Center (over 5,000 employees); L.L. Bean Inc. (over 4,000 employees); and Unum Provident (over 3,000 employees) and others.

Median household income in Portland was $48,763 (up 83.5% from $26,576 in 1990 [US Census Bureau 1990]) and median per capita income was $22,698. For full-time year round workers, males made approximately 14.6% more per year than females.

The average family in Portland consisted of 2.83 persons. With respect to poverty, 9.2% of families (down from 10.3% in 1990 [US Census Bureau 1990]) and 14.1% of individuals earned below the official U.S Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families, depending on number of persons (2-9) (US Census Bureau 2000a). In 2000, 33.4% of all families (of any size) earned less than $35,000 per year.

In 2000, Portland had a total of 31,862 housing units of which 93.3% were occupied and 35.1% were detached one unit homes. Just less than fifty percent (49%) of these homes were built before 1940. Mobile homes accounted for 0.2% of housing units; 29.6% of detached housing units had between 2 and 9 units. In 2000, the median cost for a home in this area was $121,200. Of vacant housing units, 3.0% were used for seasonal, recreational, or occasional use while 57.5% of occupied housing units were renter occupied.

15 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

Government

Portland's city governance is by a city council and a mayor, selected by the City Council and rotated to a new councilor each year. Unique to many communities, the city has a tradition of putting development issues out for public debate through forums or a vote via public referenda; however, many development decisions are made directly by the City Council.16

Fishery involvement in government

NOAA Fisheries, Fisheries Statistics Office, has three port agents based in Portland. Port agents sample fish landings and provide a 'finger-on-the-pulse' of their respective fishing communities (NMFS 2008). The Board of Harbor Commissioners supports a Harbormaster; they work in conjunction to regulate moorings, pilot and docking master licensing, and marine construction activities.17

Portland implemented ordinances to protect the working waterfront in the 1980s, made changes in the 1990s, and recently (2006) rezoned the Maine State Pier out of the Central Waterfront Zone in order to facilitate redevelopment. A large segment of Portland's waterfront from the Maine State Pier to the International Marine Terminal is zoned to preserve working waterfront business. This includes the requirement that the first floors of all buildings in the zone be limited to marine-dependent businesses or organizations.18

The City of Portland created the Portland Fish Pier Authority to manage the Fish Exchange and associated Fish Pier activities. The Fish Pier includes the Fish Exchange as well as the privately run Marine Trade Center and associated berthing space.19

Institutional

Fishing associations

One of the most important fishing associations in Portland is the Portland Fish Exchange. A non-profit organization owned by the city of Portland, it was the first open display fish auction in the United States. Currently the auction receives landings in the mornings and auctions the fish at noon Sunday through Thursday. The viability of the Fish Exchange has decreased in recent years, as much of Maine's fleet has moved to Massachusetts.20

The Maine Lobstermen's Association (MLA) was founded in 1954, and works to protect the lobster resource and the lobstermen's way of life. The association was founded by lobstermen with a goal of empowering Maine's lobster industry by representing lobstermen with a united front. The MLA is the largest commercial fishing industry group on the east coast, and represents the interests of 1200 lobstermen (MLA 2007). Other fishing associations in Portland include Maine Urchin Harvesters Association, and the Associated Fisheries of Maine (AFM).

15.1.1.1. Fishing assistance centers

The Working Waterfront Coalition is a statewide collaboration of various industry associations, non-profits, and government agencies with the goal to support Maine's working waterfronts. The Working Waterfront Access Pilot Program (WWAPP), administered by the Department of Marine Resources, provides money to applicants such as municipalities, fishing co-ops, private commercial fisheries businesses and more, ranging from $7,000 to $475,000. The intention of the program is to preserve commercial fisheries working waterfronts and to help secure property for these businesses. As of December 2007, the $2 million pilot program has reportedly supported over 400 jobs, 194 boats, and assured access to clam flats, parking, wharfage and fisheries in six towns

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16 Profile review comment, Jon Kachmar, Chair of Harbor Commission, October 18, 2007
17 Profile review comment, Jon Kachmar, Chair of Harbor Commission, October 18, 2007
18 Profile review comment, Jon Kachmar, Chair of Harbor Commission, October 18, 2007
19 Profile review comment, Jon Kachmar, Chair of Harbor Commission, October 18, 2007
20 Profile review comment, Jon Kachmar, Chair of Harbor Commission, October 18, 2007

(State of Maine 2005). Voters approved an additional $3 million to continue the program in 2007 (Vote 4 Maine 2007).

15.1.1.2. Other fishing related organizations

Seafarers Friend is a non-denominational Christian organization that assists fishermen and other seafarers at three New England ports: Boston, Portsmouth, and Portland. Recently the Portland Fishermen’s Monument Commission was established to increase awareness of the fishing industry by building a monument once they have raised necessary funds (Richardson 2004).

The Maine Fishermen’s Forum was founded in 1976, and its goal is to provide continuous opportunities to educate the public and the fishing industry about marine resource issues and fisheries, as well as to provide a platform for discussion and decision making. The Forum also holds an annual three day event which focuses awareness on issues that affect the commercial fishing industry (Maine Fishermen’s Forum 2007).

Physical

The city of Portland has infrastructure that provides full access to and within the city. Portland has its own international airport, and it has several transportation options within and to the city. Amtrak, public buses, and interstate and state highway systems provide public access to the city. Public transit within the city includes a bus and a street car system. Portland is located off I-295 which meets up with I95 (Maine Turnpike). These highways provide access to Portsmouth, NH (about 53 miles away) and Boston, MA (about 112 miles away). There are several ferry routes operating out of the ferry dock in Portland, including service to ports in Canada. These include the Portland-Yarmouth International Ferry, which provides high speed ferry service to Nova Scotia in 5.5 hours, and the Casco Bay Ferry. There are several islands in Casco Bay accessible by ferry from Portland, the most significant of which are; Peaks Island, Great Diamond, Great Chebeague, and Cliff Island.

The commercial fish pier in Portland (the Portland Fish Exchange) is where vessels unload and sell their catch to the auction. Knighville Landing is a new landing with docking facilities and access to restaurants and shopping. The landing is open to recreational boaters, water taxis and fishing boats and seasonal floats are available April to October (Portland’s Downtown District 2005). There are several marinas listed for Portland and South Portland, most of which offer full-services to recreational boaters (Maine Harbors 2006).

The International Marine Terminal is owned by the City of Portland and is located adjacent to the Casco Bay Bridge. This facility currently provides berthing space for Bay Ferries and the port’s container service for shipping to Halifax, NS.[21]

b. Involvement in Northeast Fisheries[22]

Commercial

In 2004 there are a total of 500 moorings, berthings, slips, and tie ups for commercial and recreational fishermen, of which 30% were used by commercial fishermen in Portland. A 2002 report by Coastal Enterprises, Inc. to the Maine State Planning Office recorded 271 commercial harvesters. Portland has 22 commercial private and public waterfront facilities, of which nine are dedicated to commercial fishing use. Further, commercial fishing access is perceived as a problem, and issues of development pressures, increased competition from

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21 Profile review comment, Jon Kachmar, Chair of Harbor Commission, October 18, 2007

22In reviewing the commercial landings data several factors need to be kept in mind. 1) While both federal and state landings are included, some states provide more detailed data to NMFS than others. For example, shellfish may not be included or data may be reported only by county and not by port. 2) Some communities did not have individual port codes until more recently. Before individual port codes were assigned, landings from those ports were coded at the county level or as an aggregate of two geographically close small ports. Where landings were coded at the county level they cannot be sorted to individual ports for those earlier years, e.g., prior to 2000. 3) Where aggregated codes were used, those aggregate codes may still exist and be in use alongside the new individual codes. Here the landings which are still assigned to the aggregate port code cannot be sorted into the individual ports, so port level data are only those which used the individual port code. 4) Even when individual port codes exist, especially for small ports, landings may be coded at the county level. Here again it is impossible to disaggregate these to a port level, making the port level landings incomplete. 5) In all these cases, the per port data in this profile may under report the total level of landings to the port, though all landings are accounted for in the overall NMFS database.

tourism/recreational use, and deterioration of infrastructure are reported as current threats to the commercial fishing access (Sheehan and Copperthwaite 2002). Much of Maine's fishing fleet are now berthed in Massachusetts in order to take advantage of being closer to fishing grounds, being able to sell lobsters caught as bycatch, and reduced taxes on ice, oil, and other supplies.23

Portland's landings come primarily from the large mesh groundfish species and from lobster, with over $14 million and $12 million respectively over the ten year average (see Table 1). Monkfish and herring are also important species. There were also a variety of other species landed in Portland between the years 1997-2006. Both the number of vessels home ported and number of vessels registered with owner's living in Portland slightly decreased between 1997 and 2006. The level of fishing home port value increased until 2006, where there was a drop from over $18 million in the previous year to over $13 million. The level of fishing landed port experienced a similar trend, with a dip from 2005 to 2006 of over $6 million (see Table 2).

With regard to skates, landings here are wings. They are a bycatch on trawlers, mostly large trawlers but some on smaller shrimp boats in the winter. Gillnets bring in a few skates, but not many. It's overall a small fishery in Maine. Most of the skates in local waters are Thory Skates, which cannot be landed. Some trawlers bring in Winter Skates from off Georges Bank, but most vessels fishing there land in Gloucester. There's no diesel tax in Massachusetts and you can land lobsters, which makes a trip much more lucrative. Further, fishing in the Gulf of Maine requires 2 for 1 DAS. There are no dedicated skate boats24. There are 63 skate permits that list Portland as their homeport, and 31 that list is as the town of residence of the vessel owner. These are between 1 and 3 percent of all skate permits. In 2007 landings of skate totaled 28,990 lbs or $16,794, making Portland only the 23rd highest port for skate revenues.

Landings by Species

Table 1. Dollar value of Federally Managed Groups of landings in Portland

	Average from 1997-2006	2006 only
Largemesh Groundfish25	14,433,950	10,756,311
Lobster	12,616,286	8,737,373
Monkfish	4,908,022	3,094,679
Herring	2,524,047	4,423,437
Other26	2,007,356	684,362
Scallop	65,950	72,250
Smallmesh Groundfish27	44,811	168
Skate	44,582	933
Squid, Mackerel, Butterfish	17,444	CONFIDENTIAL
Tilefish	15,623	CONFIDENTIAL
Summer Flounder, Scup, Black Sea Bass	12,334	CONFIDENTIAL
Dogfish	12,023	12,211
Bluefish	151	73

23 Profile review comment, Jon Kachmar, Chair of Harbor Commission, October 18, 2007
24 Pers. comm. Scott McNamara, NMFS Port Agent in Portland, ME, November 5, 2008.
25 Largemesh groundfish: cod, winter flounder, yellowtail flounder, American plaice, sand-dab flounder, haddock, white hake, redfish, and pollock
26 "Other" species includes any species not accounted for in a federally managed group
27 Smallmesh multi-Species: red hake, ocean pout, mixed hake, black whiting, silver hake (whiting)

Vessels by Year28

Table 16. All columns represent vessel permits or landings value combined between 1997-2006

Year	# Vessels (home ported)	# Vessels (owner's city)	Level of fishing home port ($)	Level of fishing landed port ($)
1997	123	49	14,260,267	43,219,804
1998	104	43	11,898,155	35,203,041
1999	116	47	14,781,969	42,393,247
2000	115	43	16,486,230	45,434,740
2001	109	39	15,488,517	34,356,660
2002	107	40	15,208,020	40,396,946
2003	114	40	15,478,904	28,892,963
2004	111	38	17,763,527	34,690,050
2005	111	43	18,051,059	34,613,266
2006	104	44	13,255,702	27,825,058

(Note: # Vessels home ported = No. of permitted vessels with location as homeport
 # Vessels (owner's city) = No. of permitted vessels with location as owner residence29
Level of fishing home port ($) = Landed value of fisheries associated with home ported vessels
Level of fishing landed port ($) = Landed value of fisheries landed in location)

Recreational

Portland contains a number of recreational fishing companies (Maine DMR 2006). They offer boat charters and fishing excursions.

Subsistence

Information on subsistence fishing in Portland is either unavailable through secondary data collection or the practice does not exist.

Future

Currently, in 2004, there is a heated conflict regarding the future use of the waterfront property in Portland. There are only three miles of waterfront and several industries are trying to expand, including private real estate development, commercial fisheries, cruise ship industry, and tourism/entertainment industries (Tapley 2002; Irvine 2005). The city is also in the process of building Ocean Gate – a $20 million facility for the international ferry and visiting cruise ships, located next to the Maine State Pier.30

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28 Numbers of vessels by owner's city and homeport are as reported by the permit holder on permit application forms. These may not correspond to the port where a vessel lands or even spends the majority of its time when docked.

29 The Owner-City from the permit files is technically the address at which the owner receives mail concerning their permitted vessels, which could reflect the actual location of residence, the mailing address as distinct from residence, owner business location, or the address at which a subsidiary receives mail about the permits.

30 Profile review comment, Jon Kachmar, Chair of Harbor Commission, October 18, 2007

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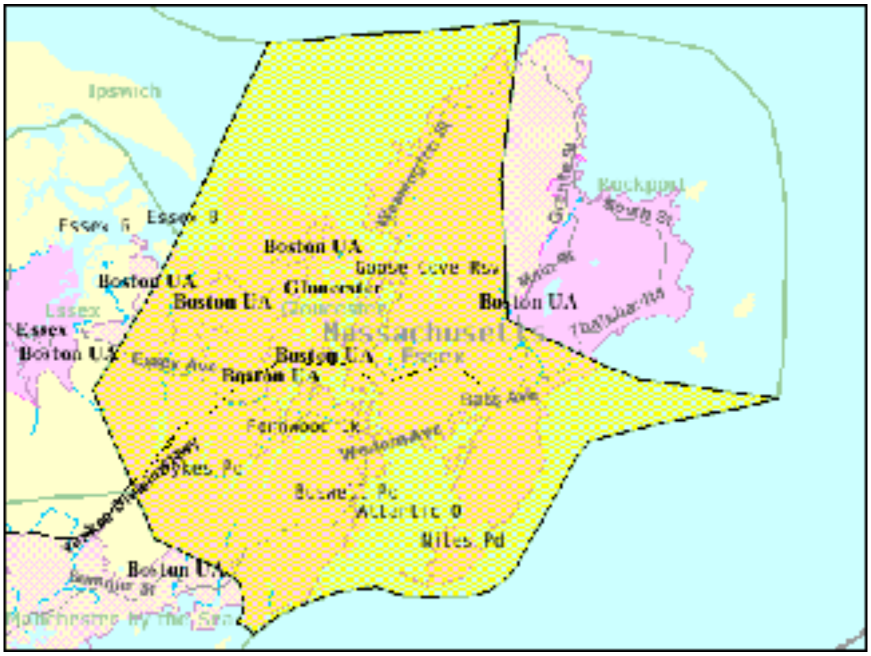
b. GLOUCESTER, MA31

Community Profile32

People and Places

15.1.2. Regional orientation

The city of Gloucester (42.62°N, 70.66°W) is located on Cape Ann, on the northern east coast of Massachusetts in Essex County. It is 30 miles northeast of Boston and 16 miles northeast of Salem. The area encompasses 41.5 square miles of territory, of which 26 square miles is land (USGS 2008).



Map 1. Location of Gloucester, MA (US Census Bureau 2000)

15.1.3. Historical/Background

The history of Gloucester has revolved around the fishing and seafood industries since its settlement in 1623. Part of the town's claim to fame is being the oldest functioning fishing community in the United States. It was established as an official town in 1642 and later became a city in 1873. By the mid 1800s, Gloucester was regarded by many to be the largest fishing port in the world. Unfortunately, with so many fishermen going to sea there were many deaths during the dangerous voyages. At least 70 fishermen died at sea in 1862 and the annual loss peaked at 249 in 1879. The construction of memorial statues and an annual memorial to fishermen demonstrates that the high death tolls are still in the memory of the town's residents.

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31 These community profiles have been created to serve as port descriptions in Environmental Impact Statements (EISs) for fisheries management actions. They also provide baseline information from which to begin research for Social Impact Assessments (SIAs). Further, they provide information relevant to general community impacts for National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and information on minorities and low income populations for Executive Order (E.O.) 12898 on Environmental Justice.

32 For purposes of citation please use the following template: "Community Profile of *Town, ST*. Prepared under the auspices of the National Marine Fisheries Service, Northeast Fisheries Science Center. For further information contact Lisa.L.Colburn@noaa.gov."

In 1924 a town resident developed the first frozen packaging device, which allowed Gloucester to ship its fish around the world without salt. The town is still well-known as the home of Gorton's frozen fish packaging company, the nation's largest frozen seafood company.

As in many communities, after the U.S. passed and enforced the Magnuson Act and foreign vessels were prevented from fishing within the country's EEZ (Exclusive Economic Zone), Gloucester's fishing fleet soon increased -- only to decline with the onset of major declines in fish stocks and subsequent strict catch regulations. For more detailed information regarding Gloucester's history. (Hall-Arber et al. 2001).

i.Demographics33

According to Census 2000 data (US Census Bureau 2000a), Gloucester had a total population of 30,273, up 5.4% from a reported population of 28,716 in 1990 (US Census Bureau 1990). Of this 2000 total, 47.9% were males and 52.1% were females. The median age was 40.1 years and 75.2% of the population was 21 years or older while 18.1% of the population was 62 or older.

The age structure (see Figure 1) between genders in Gloucester shows a peak between ages the ages of 40 to 49. Gloucester had a much lower percentage between the ages of 20-29. This may be an indication of out-migration after high school graduation for college or work since the fishing industry is not as strong as it was in the past.

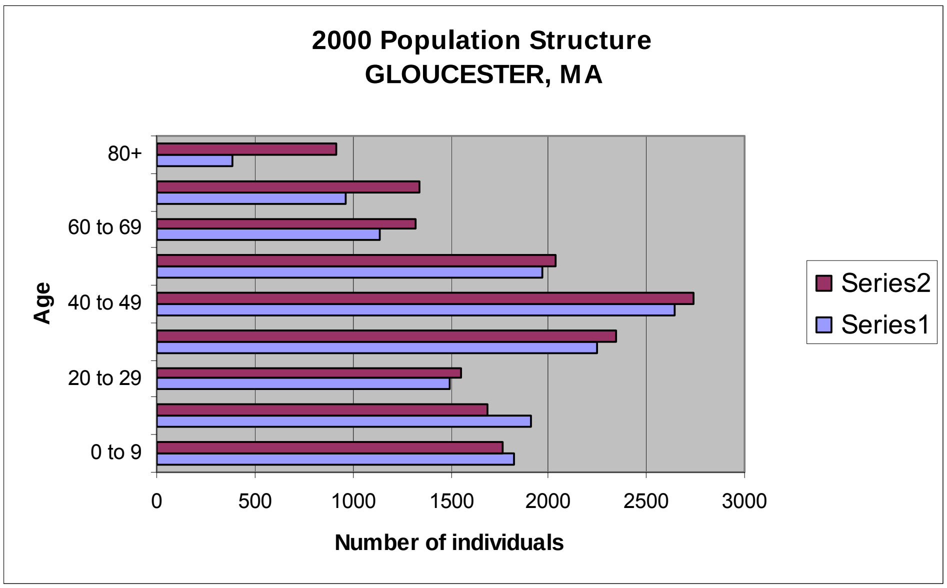

Figure 1. Gloucester's population structure by sex in 2000 (US Census Bureau 2000)

The majority of the population was white (96.9%), with 0.9% black or African American, 0.9% Asian, 0.4% Native American, and 0.1% Pacific Islander or Hawaiian (see Figure 2). Only 1.5% of the population identified themselves as Hispanic/Latino (see Figure 3). Residents linked their backgrounds to a number of different ancestries including: English (15.1%), Irish (20.1%), Italian (21.9%) and Portuguese (9.8%). With regard to region of birth, 77.4% were born in Massachusetts, 16.2% were born in a different state and 5.3% were born outside the U.S (including 2.6% who were not United States citizens).

33 While mid-term estimates are available for some larger communities, data from the 2000 Census are the only data universally available for the communities being profiled in the Northeast. Thus for cross-comparability we have used 2000 data even though these data may have changed significantly since 2000 for at least some communities.

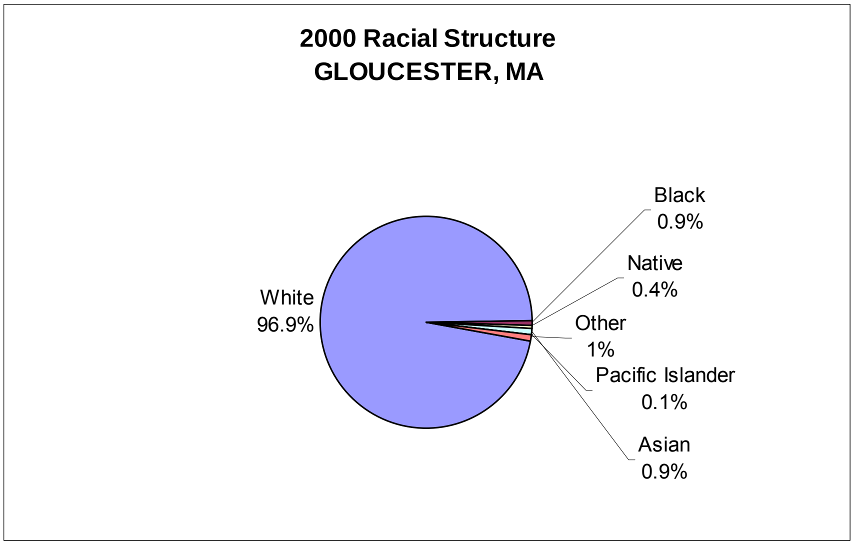

Figure 2. Racial Structure in 2000 (US Census Bureau 2000)

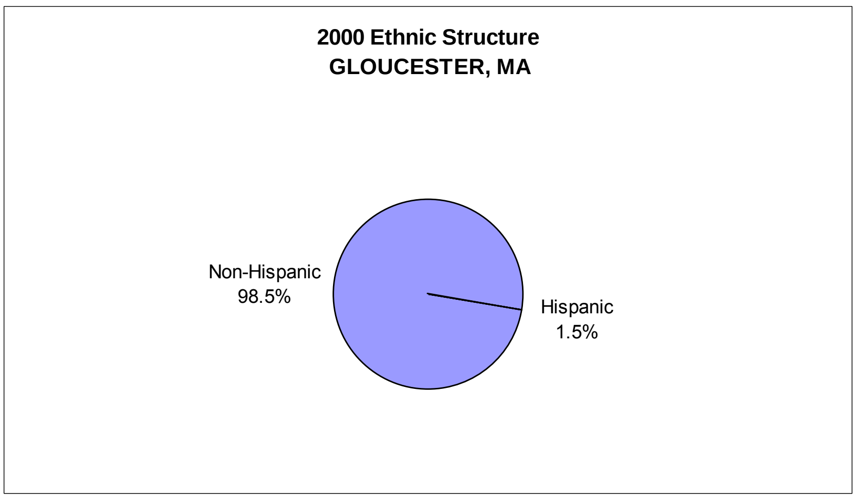

Figure 3. Ethnic Structure in 2000 (US Census Bureau 2000)

According to Griffith and Dyer (1996), "Probably 80 percent of Gloucester's fishermen are Italian (mostly Sicilian). Although large immigration flows ended in the mid-1970s, there are at least 26 vessels (out of approximately 200) on which only Italian is spoken. Even among the fishermen who arrived at a very young age, Italian is often the first and virtually only language spoken. Some of these men depend on their wives to communicate with the English-speaking population when necessary" (Griffith and Dyer 1996).

For 89.7% of the population, only English was spoken in the home, leaving 10.3% in homes where a language other than English was spoken, including 3.6% of the population who spoke English less than "very well" according to the 2000 Census. Further, Doeringer et al. (1986) noted with regard to both Gloucester and New Bedford: "[m]any workers are geographically immobile because of close ties to community and family -- ties that are reinforced in some ports by the presence of a large number of recent immigrants, many of whom lack facility in English (Miller and van Maaned 1979; Poggie and Pollnac 1980)"

Of the population 25 years and over, 85.7% were high school graduates or higher and 27.5% had a bachelor's degree or higher. Again of the population 25 years and over, 5.2% did not reach ninth grade, 9.2% attended some high school but did not graduate, 25.9% completed high school, 31.5% had some college with no degree, 8.7% received an associate's degree, 17.2% earned a bachelor's degree, and 10.2% received either a graduate or professional degree.

Although the religion percentages are not available through U.S. Census data, according to the Association of Religion Data Archives (ARDA) in 2000, the religion with the highest number of congregations and adherents in Essex County was Catholic with 70 congregations and 362,900 adherents. Other prominent congregations in the county were United Church of Christ (49 with 15,358 adherents), United Methodist (31 with 8,713 adherents), Jewish (29 with 21,700 adherents), Episcopal (28 with 14,064 adherents) and American Baptist (24 with 5,291 adherents). The total number of adherents to any religion was up 4.1% from 1990 (ARDA 2000).

Issues/Processes

As regulations tighten, fishermen have been concerned that they will go out of business. It is interesting, however, that Gloucester has gained some business from Maine vessels which land here due to tightening restrictions at the statewide level in Maine.34

Fishermen and environmentalists in the Gloucester area have been heavily opposed to the development of two offshore LNG facilities near Gloucester. The facilities require fishermen to avoid a large area for security reasons, restricting some important fishing grounds and causing vessels to have to steam longer to get around the closed areas. Environmentalists have been concerned about the effect the ship traffic may have on endangered right whales inhabiting the area. In December 2006, $6.3 million was provided to the Gloucester Fishing Community Preservation Fund as part of a $12.6 million mitigation package for the LNG terminal being built off the coastline. These funds will be used to buy fishing permits from local fishermen who wish to leave the industry, and lease them to others (Moser 2007).

15.1.4. Cultural attributes

Gloucester demonstrates dedication to its fishing culture through numerous social events, cultural memorial structures, and organizations. St. Peter's Fiesta, celebrated since 1927, is in honor of the patron saint of fishermen. It is put on by the St. Peter's Club, an organization that facilitates social interactions for fisherman. The celebration lasts for five days at the end of June each year. Festivities for this celebration include a seine boat race and a greasy pole competition, but the parade carrying a statue of St. Peter around the town and a blessing of the Italian-American fishing fleet are the foci of the festival.

2004 marked the 20th anniversary of the Gloucester Schooner Festival, which is sponsored by Gorton's Seafood. "The Gloucester Schooner Festival celebrates the major contribution of the classic fishing schooner to the history of Gloucester. The events feature the last remaining of these great old vessels and their replicas, as they compete in the Mayor's Race for the Esperanto Cup, a trophy from the first International Fishermen's Races sailed in 1920." The Gloucester Maritime Heritage Center has held Gloucester Maritime Heritage Day annually for the last four years in conjunction with the Schooner Festival; activities commemorate the city's ties to the sea.35 Another festival that celebrates the area's fishing culture is the Essex Clamfest.

Other indications of the fishing culture in Gloucester include its annual Fishermen's Memorial Service, an annual tradition to honor fishermen lost at sea. The earliest recording of this ceremony was in the mid 1800s. In the 1960s this service stopped due to the closure of Fishermen's Union Hall (the organization previously in charge of it), but in 1996 the Gloucester Mayor asked residents to revive the tradition. Now there is a committee that documents the ceremony's speeches and ceremonial walk from the American Legion Square to the Fishermen's Monument each year, so that the tradition is not lost in the future.36

Interesting infrastructure that demonstrates the significance of fishing history in this city include "Our Lady of Good Voyage Church" built in 1893 and the recent opening of the Gloucester Maritime Heritage Center, which provides visitors and the city residents with information of the historic and current fishing industry The statue named "The Man at the Wheel" was built in memory of the 5,300 fishermen that died at sea. In 2001 a new statue dedicated to fishermen's wives was built by The Gloucester Fishermen's Wives Association.

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34 Profile review comment, Caleb Gilbert, Port Agent, February 8, 2008

35 Profile review comment, Harriet Webster, Gloucester Maritime Heritage Center, October 19, 2007

36 For more information call (978) 281-9740 and (978) 283-1645 to speak with either Thelma Parks or Lucia Amero, both are on Fishermen Memorial Service Committee

Infrastructure

15.1.5. Current Economy

Gorton's of Gloucester employs approximately 500 people in their fish processing facility, but it is important to note that at least as of 2000, the company had been processing and packaging only imported fish since the mid 1990s. Major employers that provide over 100 jobs in Gloucester include the following businesses (number of employees listed in parentheses): Varian Semi Conductor Equipment Associates (950), Gorton's of Gloucester (500), Battenfeld Gloucester Engineering (400), Shaw's Supermarkets (350), Addison Gilbert Hospital (325), NutraMax Products (220), and Seacoast Nursing and Retirement (160). Cape Pond Ice employs up to 30 people during the busy summer season.

In 2007 there were 6 skate dealers in Gloucester, including Sea Fresh USA37 which also processes. Other processors in Gloucester, such as Zeus Packing, do not buy directly from boats but do process large amounts of skate. Zeus Packing employs up to 200 people in peak seasons38.

According to the U.S. Census 200039, 66.1% (24,397 individuals) of the population 16 years or older were in the labor force (see Figure 4), of which 3.2% were unemployed, 0.2% were in the Armed Forces, and 62.7% were employed.

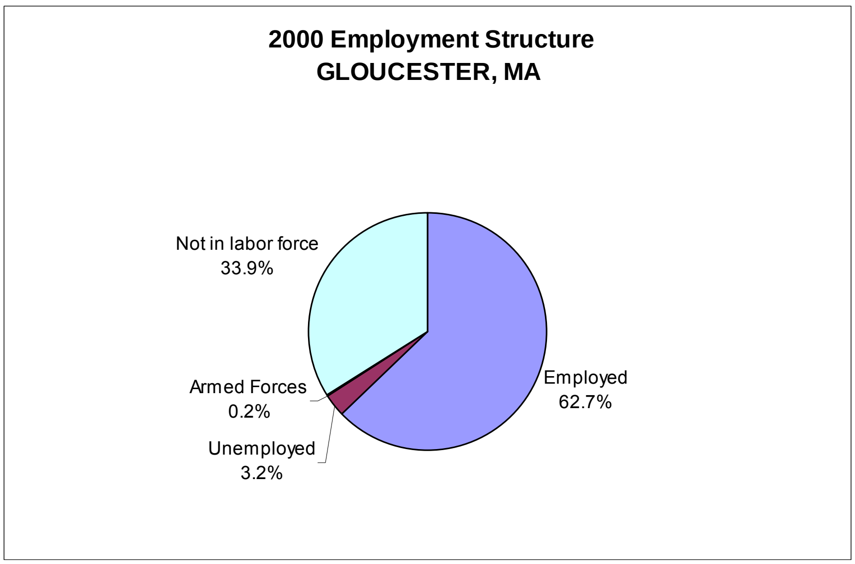

Figure 4. Employment Structure in 2000 (US Census Bureau 2000)

According to Census 2000 data, jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 382 or 2.5% of all jobs. Self employed workers, a category where fishermen might be found, accounted for 1,319 positions or 8.6% of jobs. Educational, health and social services (20.2%), manufacturing (16.7%), retail trade (10.8%) and arts, entertainment, recreation, accommodation and food services (9.2%) were the primary industries.

The median household income in 2000 was $47,772 (up 46.1% from $32,690 in 1990 [US Census Bureau 1990]) and median per capita income in 2000 was $25,595. For full-time year round workers, males made approximately 35.7% more per year than females.

The average family in Gloucester in 2000 consisted of 3.0 persons. With respect to poverty, 7.1% of families (up from 6.7% in 1990 [US Census Bureau 1990a]) and 8.8% of individuals were below the U.S. Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families,

37 Pers. com. Larry Lindgren, Sea Fresh USA, October 24, 2008.
38 Pers. com. Christian Christianson, owner Zeus Packing, November 5, 2008.
39 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

depending on number of persons (2-9) (US Census Bureau 2000a). In 2000, 26.0% of all families (of any size) earned less than $35,000 per year.

In 2000, Gloucester had a total of 13,958 housing units, of which 90.2% were occupied and 54.3% were detached one unit homes. Just over half (53.9%) of these homes were built before 1940. Mobile homes accounted for 0.1% of housing units; 88.7% of detached units had between 2 and 9 rooms. In 2000, the median cost for a home in this area was $204,600. Of vacant housing units, 70.4% were used for seasonal, recreational, or occasional use. Of occupied units, 40.3% were renter occupied.

15.1.6. Government

Gloucester's city government is run by an elected mayor and city council.

ii. Fishery involvement in government

The Gloucester Fisheries Commission is the only municipal-level government sector focused on fisheries, but it is currently inactive. However, NOAA Fisheries, Fisheries Statistics Office, has two port agents based here. Port agents sample fish landings and provide a 'finger-on-the-pulse' of their respective fishing communities. The NOAA Fisheries Northeast Regional Office is based in Gloucester; many of the employees here work closely with the city.40 There is also a harbor master in town.

15.1.7. Institutional

iii. Fishing associations

Both the Gloucester Fishermen's Association and Gloucester Lobstermen's Association are located in Gloucester (Stevenson nd). The Massachusetts Fisherman's Partnership focuses on issues for fishermen in different ports in Massachusetts. The Partnership responded to the need of health care for fishermen and their families by developing the Fishing Partnership Health Insurance Plan with federal and state aid. This plan has been in place since 1997 and reduces the amount of money that fishermen's families have to pay to be covered by health insurance (Hall-Arber et al. 2001).

Fishing assistance centers

The Gloucester Fishermen and Family Assistance Center was established in 1994. Currently it is run and funded by grants from the Department of Labor. "In an effort to help fishermen, their families, and other fishing workers to transition to new work, Massachusetts applied for and received grants from the U. S. Department of Labor to set up career centers. National Emergency Grants (NEG) fund centers in Gloucester, New Bedford and Cape Cod and the Islands to provide re-employment and re-training services to those individuals who can no longer make an income from fishing and fishing related businesses" (Commonwealth Corporation 2007).

The Gloucester Fishermen's Wives Association (GFWA) was founded in 1969 by the wives of Gloucester fishermen. In 2001 they constructed a memorial statue to the fishermen's wives of Gloucester.

The Gloucester Fishing Community Preservation Fund was established in 2007 to manage a project buying fishing permits from those who wish to get out of the industry and leasing them to others, using the funding received in a mitigation package for the development of an offshore LNG terminal in the fishing grounds (Moser 2007).

Other fishing related organizations

Northeast Seafood Coalition is a non-profit, membership organization located in Gloucester, focused on representing the interests of commercial fishermen. "The Gloucester Maritime Heritage Center is the only working historic waterfront in the Northeast that combines a historic working marine railway, where wooden vessels are hauled and repaired, with a Gulf of Maine aquarium, ongoing construction of wooden boats, and educational exhibits and programs" (GMHC 2007). They have a number of educational programs for children and teens, including field trips, boat building, internships, and after school programs (GMHC 2007).

40 Profile review comment, Caleb Gilbert, Port Agent, February 8, 2008

Physical

There are several ways to access Gloucester and to travel within the city. Cape Ann Transportation Authority (CATA) is the bus system that runs from Gloucester to Rockport. State Routes 128, 127, and 133 are highway system providing access within and to the city. The neighboring town of Beverly has a small municipal airport with three asphalt runways. Amtrak and MBTA (Massachusetts Bay Transportation Authority) trains provide public transportation from Gloucester to the Boston area (State of Massachusetts 2007). Gloucester is approximately 35 miles from Boston and 106 miles from Portland, Maine by car (MapQuest nd).

Gloucester has been a full service port for the commercial fishing industry in the region; however, this status would be jeopardized if one or more of the facilities went out of business. Thus far it has provided all the necessary facilities for fishermen in the town, and even facilities needed for neighboring fishing communities. Offloading facilities located within the city include Capt. Vince, which deals almost exclusively in lobster, the Gloucester Seafood Display Auction, Ocean Crest, John B. Wrights, NE Marine Resources, and a few others who have been offloading fish in Gloucester for years (Robinson S 2003). There are nine lobster buyers that are either based in or come to Gloucester for purchasing.

Fishermen can purchase necessary equipment and have it repaired in town by either Gloucester Marine Railways or Rose Marine, both of which can provide haul out service for large vessels (Robinson 2003). Additionally, the Gloucester Maritime Heritage Center specializes in large wooden vessel restoration projects.41 There are three other facilities that provide services for vessels under 40ft. Gloucester fishermen have a choice of nine gear and supply shops in town (Robinson S 2003). Harbor plans in 2006 have been formulated to maintain the necessary fishing infrastructure (Hall-Arber 2001). There are at least 11 locations that provide long-term mooring space and seven for temporary mooring space. At least four facilities provide a place for fishermen to purchase fuel (Robinson S 2003). Whole Foods runs the 17,000 sq. ft. Pigeon Cove seafood processing facility, which supplies Whole Foods markets throughout the country with seafood. Some of the fish processed here is caught in Gloucester or Rockport, but much of it is imported from elsewhere in New England or flown in from other parts of the world (Hall-Arber 2001).

Cape Pond Ice, started in 1848, is the only ice business remaining in Gloucester, and provides other ice services, such as vegetable transport and ice sculptures to offset the declining business from the fishing industry. B&N Gear is the only bottom trawl gear seller in town (Finch 2004). Gloucester Seafood Display Auction, opened in 1997 by the Cuilla family, quickly grew to become the largest open display auction of fresh seafood in North America as of 2000. This allows buyers to purchase fish directly from the boats rather than having to rely on fish brokers, as they did in the past (Dornbusch 2003).

Involvement in Northeast Fisheries42

15.1.8. Commercial

Although there are threats to the future of Gloucester's fishery, the fishing industry remains strong in terms of recently reported landings. Gloucester's commercial fishing industry had the 13th highest landings in pounds (78.5 million) and the nation's ninth highest landings value in 2002 ($41.2 million). In 2003 recorded state landings totaled 11.6 million pounds, with catches of lobster, cod, and haddock at 2.0 million, 4.7 million, and 2.6 million pounds landed, respectively (US Fisheries 2002). In 2002 Gloucester had the highest landings value of lobster in

41 Profile review comment, Harriet Webster, Gloucester Maritime Heritage Center, October 19, 2007

42 In reviewing the commercial landings data several factors need to be kept in mind. 1) While both federal and state landings are included, some states provide more detailed data to NMFS than others. For example, shellfish may not be included or data may be reported only by county and not by port. 2) Some communities did not have individual port codes until more recently. Before individual port codes were assigned, landings from those ports were coded at the county level or as an aggregate of two geographically close small ports. Where landings were coded at the county level they cannot be sorted to individual ports for those earlier years, e.g., prior to 2000. 3) Where aggregated codes were used, those aggregate codes may still exist and be in use alongside the new individual codes. Here the landings which are still assigned to the aggregate port code cannot be sorted into the individual ports, so port level data are only those which used the individual port code. 4) Even when individual port codes exist, especially for small ports, landings may be coded at the county level. Here again it is impossible to disaggregate these to a port level, making the port level landings incomplete. 5) In all these cases, the per port data in this profile may under report the total level of landings to the port, though all landings are accounted for in the overall NMFS database.

Massachusetts with the state-only landings worth $2 million and the combined state and federal landings recorded from federally permitted vessels was just over $10 million.

Gloucester's federally managed group with the highest landed value was largemesh groundfish with nearly $20 million in 2006 (see Table 1). Lobster landings were second in value, bringing in more than $10 million in 2006, a significant increase from the 1997-2006 average value of just over $7 million. Monkfish and herring were also valuable species; both had more valuable landings in 2006 than the ten year average values. The number of vessels home ported (federal) increased slightly from 1997 to 2006, but there was a slight reduction for the years 1998, 1999, and 2000 (see Table 2).

Gloucester has the second highest level of skate permits of any town in 2007, both as measured by listed homeport (7.8% of all skate permits) and by owner's town of residence (5.7% of all skate permits). It is 2nd of the 4 ports which rise above 5% in either category. In 2007 Gloucester was 8th of nine ports showing revenue from skate in excess of $100,000 and 10th of fifteen ports showing landings from skate in excess of 100,000lbs.

15.1.9. Landings by Species

Table 1. Dollar value of Federally Managed Groups of landing in Gloucester

	Average from 1997-2006	2006 only
Largemesh Groundfish43	17,068,934	19,577,975
Lobster	7,036,231	10,179,221
Monkfish	3,556,840	4,343,644
Other44	3,246,920	1,906,551
Herring	3,127,523	5,623,383
Squid, Mackerel, Butterfish	1,065,567	3,692,506
Scallop	735,708	1,113,749
Smallmesh Groundfish45	732,353	254,287
Dogfish	375,972	316,913
Skate	63,488	27,334
Tilefish	52,502	245,398
Surf Clams, Ocean Quahog	29,033	77,805
Bluefish	21,672	18,116
Summer Flounder, Scup, Black Sea Bass	1,286	603

Note: Red crab are also landed, but cannot be reported due to confidentiality

iv. Vessels by Year46

Table 2. All columns represent vessel permits or landings value combined between 1997 and 2006

43 Largemesh groundfish: cod, winter flounder, yellowtail flounder, American plaice, sand-dab flounder, haddock, white hake, redfish, and pollock

44 "Other" species includes any species not accounted for in a federally managed group.

45 Smallmesh multi-species: red hake, ocean pout, mixed hake, black whiting, silver hake (whiting)

46 Numbers of vessels by owner's city and homeport are as reported by the permit holder on permit application forms. These may not correspond to the port where a vessel lands or even spends the majority of its time when docked.

Year	# Vessels (home ported)	# Vessels (owner's city)	Level of fishing home port ($)	Level of fishing landed port ($)
1997	277	216	15,483,771	23,497,650
1998	250	196	18,078,326	28,394,802
1999	261	199	18,396,479	25,584,082
2000	261	202	19,680,155	41,929,807
2001	295	230	18,614,181	37,961,334
2002	319	247	21,316,029	37,795,464
2003	301	225	22,451,526	37,795,464
2004	298	227	24,531,345	42,760,975
2005	287	217	34,319,544	45,966,974
2006	284	213	34,255,146	47,377,485

(Note: # Vessels home ported = No. of permitted vessels with location as homeport
 # Vessels (owner's city) = No. of permitted vessels with location as owner residence[47]
Level of fishing home port ($) = Landed value of fisheries associated with home ported vessels
Level of fishing landed port ($) = Landed value of fisheries landed in location)

15.1.10. Recreational

Gloucester is home to roughly a dozen fishing charter companies and party boats fishing for bluefin tuna, sharks, striped bass, bluefish, cod, and haddock. Between 2001- 2005, there were 50 charter and party vessels making 4,537 total trips registered in logbook data by charter and party vessels in Gloucester carrying a total of 114,050 anglers (NMFS VTR data). Some of the charter and party boats may be captained by part-time fishermen that needed a new seasonal income (Cape Ann Chamber of Commerce 2007). The Yankee Fleet offers deep sea fishing on their party boats on half-day, full-day, and overnight trips and charter fishing trips Sandy B Fishing Charters takes passengers in search of cod, haddock, tuna, and striped bass. Black Pearl Charters also has offshore trips for cod and haddock, and inshore trips for bluefish and striped bass.

15.1.11. Subsistence

Information on subsistence fishing in Gloucester is either unavailable through secondary data collection or the practice does not exist.

FUTURE

The Massachusetts Department of Housing and Community Development recognize that the fishing industry is changing. The city must adapt to these major economic changes. Although the city is preparing for other industries, such as tourism, they are also trying to preserve both the culture of fishing and the current infrastructure necessary to allow the fishing industry to continue functioning. The city is also currently working with the National Park Service to plan an industrial historic fishing port, which would include a working fishing fleet (State of Massachusetts 2007). This would preserve necessary infrastructure for the fishing industry and preserve the culture to further develop tourism around fishing.

According to newspaper articles (Finch 2004) and city planning documents, residents have conflicting visions for the future of Gloucester. Many argue that the fishing industry is in danger of losing its strength. For example an anthropological investigation of the fishing infrastructure in Gloucester (Robinson 2003) found that the port is in danger of losing its full-service status if some of the businesses close down. With stricter governmental regulations on catches to rebuild declining and depleted fish stocks, many residents are choosing to find other livelihood strategies, such as tourism or other businesses. In 1996, the NMFS piloted a vessel buyback program to decrease the commercial fishing pressure in the northeast. Of the 100 bids applying to be bought by the government, 65 were from Gloucester fishermen (Gorlick 2000). This could be taken as an indication that these

47 The Owner-City from the permit files is technically the address at which the owner receives mail concerning their permitted vessels, which could reflect the actual location of residence, the mailing address as distinct from residence, owner business location, or the address at which a subsidiary receives mail about the permits.

fishermen do not see any future in fishing for themselves in the Northeast. NMFS adjusted this program to just buy back permits rather than vessels. Massachusetts had the highest sale of permits, though the number of Gloucester permits could not be obtained at this time.48

On the other hand, there are fishermen who claim the fishing and seafood industries will remain strong in the future, despite the pessimistic forecasts. The Gloucester Seafood Festival and Forum is one example of celebrating and promoting Gloucester seafood industry (City of Gloucester 2007).

Whole Foods / Pigeon Cove recently expanded its facility to 17,000 sq. ft., and has plans to expand further (Hall-Arber et al. 2001).

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48 If buyback data is needed on the port level, contact Drew Kitts at NEFSC in Woods Hole, MA.

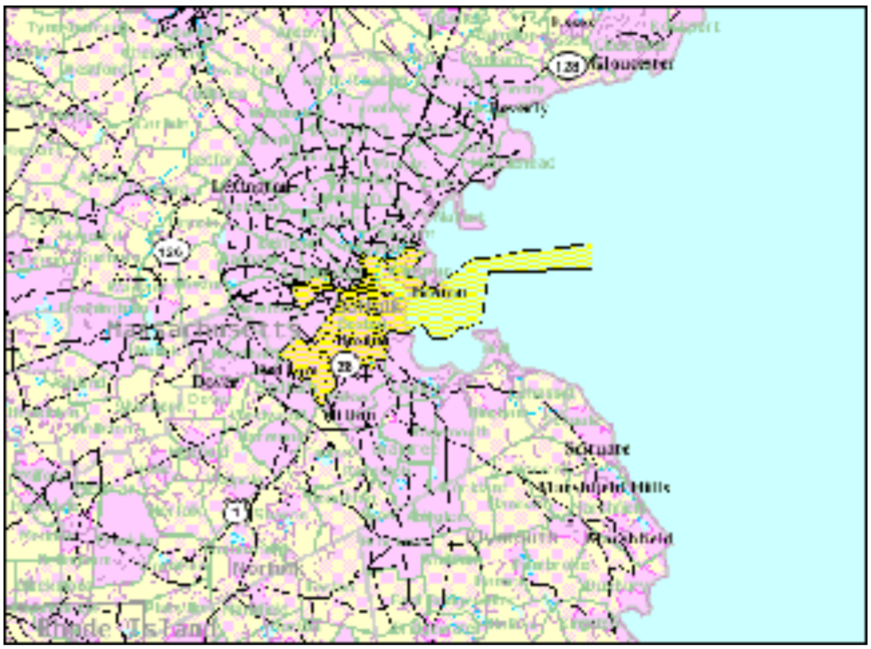
c. **BOSTON, MA**[49]

Community Profile[50]

c. People and Places

Regional orientation

The City of Boston (42.35º N, 71.06º W) is the capital of Massachusetts, and is located in Suffolk County. Boston Harbor opens out onto Massachusetts Bay (USGS 2008). The city covers a total of 89.6 square miles, of which only 48.4 square miles (54%) is land.



Map 1. Location of Boston, MA (US Census Bureau 2000)

Historical/Background

The City of Boston has been an important port since its founding in 1630. Early on, it was the leading commercial center in the colonies (Banner 2005). During colonial times, the city's economy was based on fishing, shipbuilding, and trade in and out of Boston Harbor. "From its founding until the 1760s, Boston was America's largest, wealthiest, and most influential city" (University Archives nd). It also played an important role in our nation's history, as the location of the Boston Tea Party, the Boston Massacre, and the beginning of the American Revolution. After the Revolutionary War, Boston became one of the wealthiest international ports in the world, exporting products such as rum, tobacco, fish, and salt (Lovestead 1997). Once an important manufacturing center, with many factories and mills based along Boston's numerous rivers and in the surrounding communities, many of

49 These community profiles have been created to serve as port descriptions in Environmental Impact Statements (EISs) for fisheries management actions. They also provide baseline information from which to begin research for Social Impact Assessments (SIAs). Further, they provide information relevant to general community impacts for National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and information on minorities and low income populations for Executive Order (E.O.) 12898 on Environmental Justice.
50 For purposes of citation please use the following template: "Community Profile of *Town, ST*. Prepared under the auspices of the National Marine Fisheries Service, Northeast Fisheries Science Center. For further information contact Lisa.L.Colburn@noaa.gov."

the manufacturing jobs began to disappear around the early 1900s, as factories moved to the South. These industries were quickly replaced, however, by banking, financing, retail, and healthcare, and Boston later became a leader in high-tech industries (Banner 2005). The city remains the largest in New England and an important hub for shipping and commerce, as well as being an intellectual and educational hub. The Boston Fish Pier, located on the South Boston waterfront, has been housing fishermen for almost a century, and is the oldest continuously operating fish pier in the United States (BHA nd). The Fish Pier is also home to the nation's oldest daily fish auction.

Demographics**51**

According to Census 2000 data, Boston had a total population of 589,141, up 2.6% from the reported population of 574,283 in 1990 (US Census Bureau 1990). Of this total in 2000, 51.9% were female and 48.9% were male. The median age was 31.2 years and 73.5% of the population was 21 years or older while 12.2% were 62 or older.

Unlike most other Northeast fishing communities, Boston's population structure (Figure 1) shows a preponderance of 20-29 year-olds, representing the large influx of young people who move there in search of jobs, as well as a large population of students. There are also many residents in the 30-39 year old category.

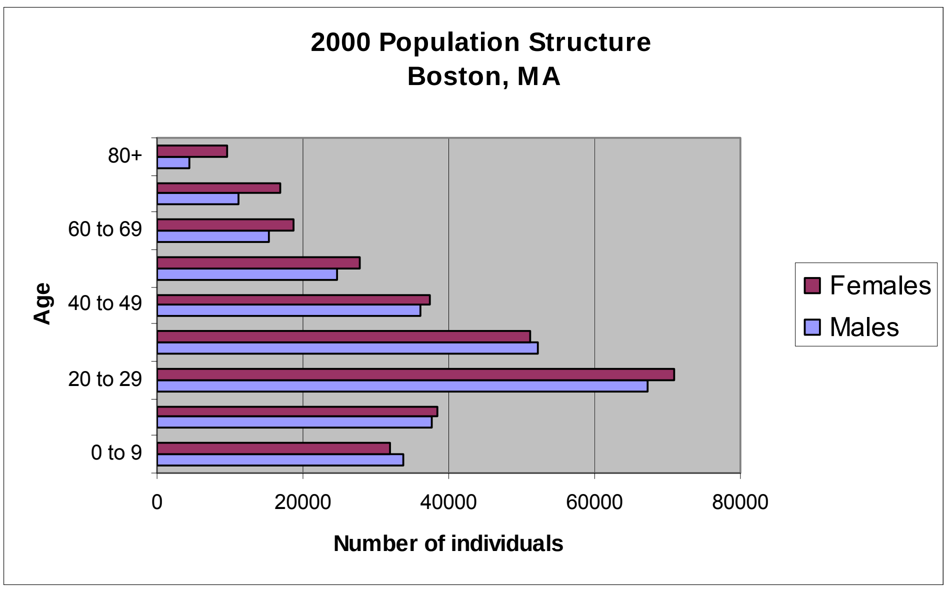


Figure 1. Population structure by sex in 2000 (US Census Bureau 2000)

The majority of the population of Boston in 2000 was white (54.3%), with 26.4% of residents black or African American, 0.9% Native American, 7.7% Asian, and 0.3% Pacific Islander or Hawaiian (Figure 2). A total of 14.4% of the total population identified themselves as Hispanic/Latino (Figure 3). Residents linked their heritage to a number of ancestries including: Irish (15.8%), Italian (8.3%), West Indian (6.4%), and English (4.5%). With regard to region of birth, 47.4% were born in Massachusetts, 23.5% were born in a different state and 25.8% were born outside of the U.S. (including 16.2% who were not United States citizens).

51 While mid-term estimates are available for some larger communities, data from the 2000 Census are the only data universally available for the communities being profiled in the Northeast. Thus for cross-comparability we have used 2000 data even though these data may have changed significantly since 2000 for at least some communities.

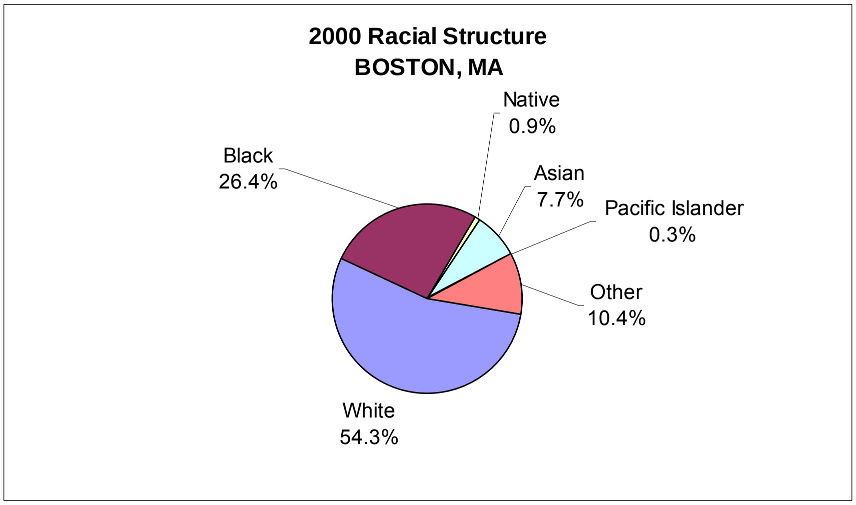


Figure 2. Racial Structure in 2000 (US Census Bureau 2000)

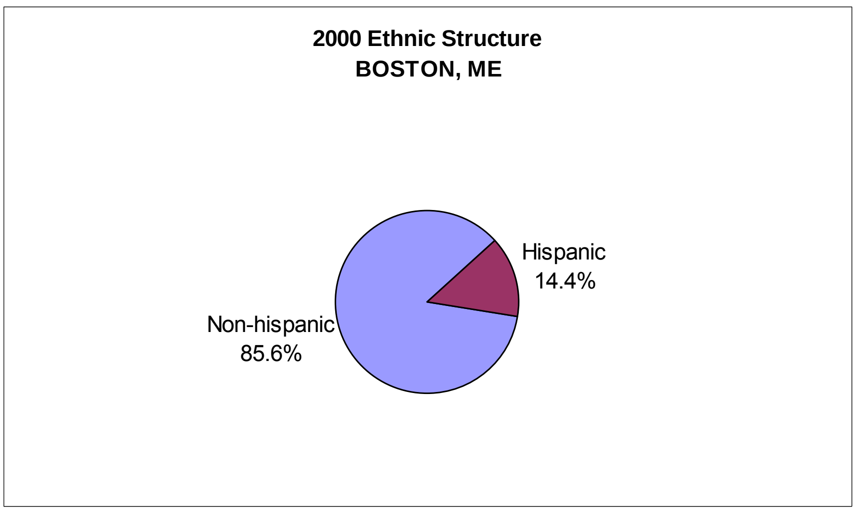


Figure 3. Ethnic Structure in 2000 (US Census Bureau 2000)

For 66.6% of the population 5 years old and higher in 2000, only English was spoken in the home, leaving 33.4% in homes where a language other than English was spoken, including 16.3% of the population who spoke English less than "very well."

Of the population 25 years and over, 78.9% were high school graduates or higher and 35.6% had a bachelor's degree or higher. Again of the population 25 years and over, 9.1% did not reach ninth grade, 12.0% attended some high school but did not graduate, 24.0% completed high school, 14.5% had some college with no degree, 4.9% received their associate's degree, 20.2% earned their bachelor's degree, and 15.3% received either a graduate or professional degree.

Although religion percentages are not available through the U.S. Census, according to the Association of Religion Data Archive (ARDA) in 2000 the religion with the highest number of congregations and adherents in Suffolk County was Catholic with 73 congregations and 205,060 adherents. Other prominent congregations in the county were Jewish (22 with 24,700 adherents), American Baptist Churches in the USA (35 with 9,115) and Episcopal (25 with 9,405 adherents). The total number of adherents to any religion was up 44.8% from 1990 (ARDA 2000).

Issues/Processes

The high cost of real estate in Boston means that fishermen and other maritime users of waterfront areas are face displacement issues. Groups such as the Boston Harbor Association are working to prevent this from happening (BHA nd). There are now only two areas for commercial fishermen to tie-up and unload their catch – Boston Fish Pier and the Cardinal Medeiros docks (Medeiros dock is used almost exclusively by lobstermen52) – and limited options for containers and bulk cargo handling. Due to redevelopment, much of the working waterfront has been lost to the construction of condos, office buildings, hotels, and other non-marine related businesses.53

The Conservation Law Foundation (CLF) filed suit against the Massachusetts Port Authority (Massport) in 2004, for failing to maintain the Boston Fish Pier (which they had recently purchased) as a working commercial pier. The Pier is in need of repair and the businesses relying on the pier have not been issued long-term leases (CLF 2004). The pier recently underwent a massive construction project, including replacing its barrier walls.54

The Massachusetts Division of Marine Fisheries (MADMF) proposed in 2004 to shut down a section of Massachusetts Bay extending from Boston north to Marblehead to cod fishing, in order to protect prime spawning ground. This proposal caused much concern for fishermen in the area, already severely limited by restrictions on cod fishing (Keane 2005). The MADMF not only proposed the Cod Closure Zone, but it has been enacted each subsequent year to protect spawning cod. The MADMF conducts directed research on these activities and there are indicators that this area may help support the largest remaining aggregation of spawning cod in the Gulf of Maine.55

In 2005 the city was looking at plans to develop a liquid natural gas terminal on Outer Brewster Island, the outermost of the city's harbor islands, a plan that drew much criticism from environmentalists and others (Associated Press 2005). Lobster fishermen in particular worried that this would disrupt lobster habitat, and that the facility would prevent them from accessing important fishing areas (Jette 2005).

The MWRA sewer/outfall project, the two offshore LNG terminals, the Hubline, proposed cobble mining and, large U.S. Army Corps dredging projects have also been suggested as having fishing-related impacts. In addition, the Marine Protected Area of Stellwagen Bank has also affected fishing activities in the area.56

i.Cultural attributes

Boston hosts a number of events which celebrate the city's connections with the sea. The annual Blessing of the Fleet is held at the Boston Marina and Shipyard. The city holds an annual Harborfest as part of the city's Fourth of July celebrations, which celebrates the city's role in American history as a maritime port, and includes the Boston Chowderfest. The International Boston Seafood Show is primarily a culinary trade show. The East Boston Seaport Festival celebrates the city's maritime heritage. The National Park Service is now controlling the harbor islands, which are a showpiece of Boston Harbor.

Infrastructure

Current Economy

According to the U.S. Census 200057, 58.9% (308,395 individuals) of the total population 16 years of age and over were in the labor force (Figure 4), with 4.6% unemployed, 0.1% in the Armed Forces, and 58.9% employed.

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52 Community Review comments; Boston Harbormaster, Philip Terenzi, September 28, 2007
53 Community Review comments; Vincent Malkoski, Division of Marine Fisheries, October 16, 2007
54 Profile review comment, Caleb Gilbert, Port Agent, February 8, 2008.
55 Community Review comments; Vincent Malkoski, Division of Marine Fisheries, October 16, 2007
56 Community Review comments; Vincent Malkoski, Division of Marine Fisheries, October 16, 2007
57 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

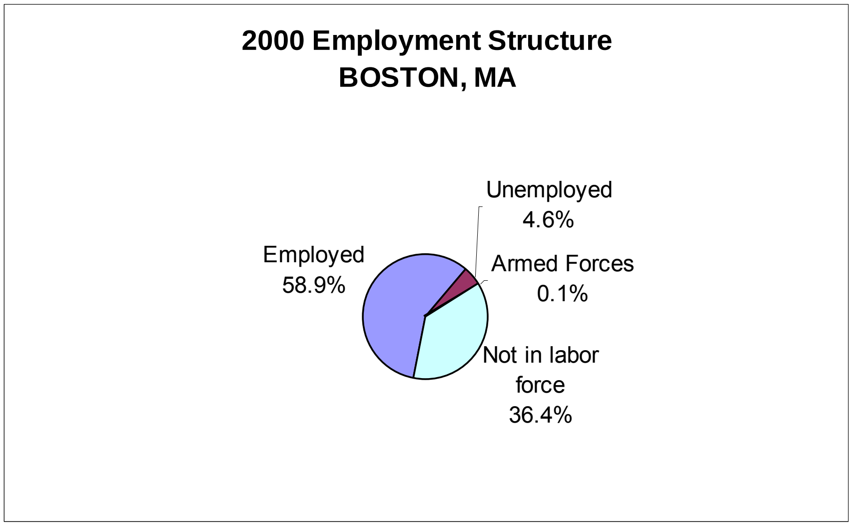

Figure 4. Employment Structure in 2000 (US Census Bureau 2000)

"Boston's seafood processing industry includes 88 companies, employs nearly 2,000 people, and generates roughly $650 million in annual sales to regional, national, and international markets" (Massport 2001)." Stavis Seafoods, a fish processing and distribution facility on the Boston waterfront, employs over 100 people. The new Harbor Seafood Center is expected to create 120 jobs (Massport 2001). Additionally, the development of Boston's Seaport District is likely to create thousands of jobs over the next decade (Gaston Institute 2003). One of the 4 companies buying skate in Boston in 2007 was Ideal Seafood Inc. A processor, skate is (similar to the other 4 buyers) is a marginal addition to the bottom line, "more a side business"58.

According to Census 2000 data, jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 296 positions or 0.1% of all jobs. Self employed workers, a category where fishermen might be found, accounted for 12,988 positions or 4.5% of jobs. Education, health, and social services (26.8%); professional, scientific, management, administrative, and waste management services (14.9%); finance, insurance, real estate, and rental and leasing (10.4%); and arts, entertainment, recreation, accommodation and food services (9.2%) were the primary industries.

Median household income in Boston was $39,629 (up 35.8% from $29,180 in 1990 (US Census Bureau 1990) and per capita income was $23,732. For full-time year round workers, men made approximately 15.5% more per year than women.

The average family in Boston in 2000 consisted of 3.17 persons. With respect to poverty, 15.3% of families (up from 15.0% in 1990 (US Census Bureau 1990) and 19.5% of individuals were below the U.S. Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families, depending on number of persons (2-9) (US Census Bureau 2000b). In 2000, 39.9% of all families (of any size) earned less than $35,000 per year.

In 2000, Boston had a total of 251,935 housing units, of which 95.1% were occupied and 11.7% were detached one unit homes. A total of 53.5% of these homes were built before 1940. Mobile homes, boats, RVs and vans accounted for 0.1% of the total housing units; 88.1% of detached units had between 2 and 9 rooms. In 2000, the median cost for a home in this area was $190,600. Of vacant housing units, 12.6% were used for seasonal, recreational, or occasional use. Of occupied units 67.8% were renter occupied.

Government

Boston has a mayor and a thirteen member city council. Boston also has a Harbormaster (State of Massachusetts 2007).

58 Pers. com. Sal Patania, owner, Ideal Seafood, Inc., November 6, 2008.

Fishery involvement in government

The Port of Boston has a Designated Port Area which is restricted to maritime industry to allow the continued existence of a working port. The Boston Redevelopment Authority is Boston's planning and economic development agency, and is involved with waterfront development. The Seaport Advisory Council in Boston is involved in dredging activities, which likely impact fisheries and fishing-related activities. These agencies and organizations help contribute to environmental improvements for commercial fishing. Under the guidance of the State's Office of Coastal Zone Management, there are Designated Port Areas (DPAs), which make up a large portion of the working industrial waterfront in the Boston area. According to The Boston Harbor Association, DPAs, amongst other things, provide benefits to job creation in the shipping, cruise, and fish processing industries (BHA 2003). The Massachusetts Water Resources Authority (MWRA) is also involved in resource monitoring, and conducts a regular biomonitoring program in the Massachusetts Bay for fish and shellfish. Specific sites where data are collected include Boston Harbor and the Bays and the Future Outfall Site off Nantasket Beach, Broad Sound, and East Cape Cod Bay (Lefkovitz and McLeod 2000). Boston also has an active harbormaster's office.

Institutional

Fishery associations

Boston lobstermen have formed the Boston Harbor Lobster Cooperative (Hall-Arber et al. 2001) and the Boston Harbor Lobstermen's Association.[59] The General Category Tuna Association is also located in Boston (Stevenson nd).

The Massachusetts Fisherman's Partnership focuses on issues for fishermen in different ports in Massachusetts. The Partnership responded to the need of health care for fishermen and their families by developing the Fishing Partnership Health Insurance Plan with federal and state aid. This plan has been in place since 1997 and reduces the amount of money that fishermen's families have to pay to be covered by health insurance (Hall-Arber et al. 2001).

Fishing assistance centers

Boston has multiple organizations dedicated to aiding mariners passing through Boston, including commercial fishermen. The Seafarer's Friend Society is a non-denominational Christian ministry to the maritime service, which provides a number of services to mariners including providing food, support, and access to job services. The Boston Port and Seaman's Aid Society runs the Mariners House, which offers a place for traveling mariners to stay, as well as services to assist mariners, and provides scholarships and grants to further its mission.

Other fishing-related organizations

"The Boston Harbor Association is committed to preserving and promoting Boston Harbor as a Working Port." The BHA is a private non-profit working with several sectors on fishing-related issues including government/ public officials, private developers and commercial interests, maritime residents, residents, and environmental groups. The Association is working to create a framework for discussions about current and future development along Boston's waterfront (BHA nd). The organization Save the Harbor, Save the Bay is also working to protect Boston Harbor from environmental degradation, as well as developing an accessible waterfront and promoting a connection between the community and the sea.

The New England Aquarium, located in Boston, is conducting research on lobster aquaculture, bluefin tuna, bycatch reduction, North Atlantic right whales, and other topics relevant to Boston area fishermen. The Conservation Law Foundation, also headquartered in Boston, is working to promote sustainable fisheries in New England, including working to develop an area-based fisheries management system and ongoing efforts to end overfishing of groundfish stocks through legal action (CLF 2006).

59 Community Review comments; Vincent Malkoski, Division of Marine Fisheries, October 16, 2007

Physical

"Boston is 106 miles south of Portland, Maine; 44 miles northeast of Providence, Rhode Island; 93 miles northeast of Hartford, Connecticut; and 218 miles northeast of New York City" (State of Massachusetts 2007). Logan International Airport is located in East Boston, and is New England's largest airport. The airport is also easily accessible from the piers, facilitating the shipping of seafood. Boston has a subway system, a commuter rail system, and Amtrak service to Portland, Providence, New York, and beyond. There is also a large bus station in the city, as well as extensive local bus service throughout the city and the metropolitan area. Interstates 90 and 93 run through the heart of Boston, while Interstate 95 runs outside of the city, making Boston a very accessible city by road (MapQuest nd).

The Boston Fish Pier, located on the South Boston waterfront, has been housing fishermen for almost a century, and is the oldest continuously working fish pier in the United States. The pier houses a number of fish-processing facilities, as well as the fish auction and provides dock space for many of the area's fishermen (Boston Harbor Association nd). The Boston Fish Exchange is the nation's oldest daily fish auction, in operation for over 100 years.

The Harbor Seafood Center houses several seafood processors in its 65,000 square feet of space, opened in 2001. Legal Seafoods also operates a 75,000 square foot processing facility in this same area. Stavis Seafoods, located on the Boston waterfront since 1929, operates a groundfish processing facility here, as well as a distribution operation, shipping fresh and frozen seafood around the world. Channel Fish Processing Co. is one of the many fish processing companies located in this area of Boston that buys catch directly from the docks of fishing communities around New England, and processes it here for distribution. The James Hook Lobster Co has been in operation since 1925 and is a landmark.

The Greater Boston Harbor has 13 Clean Vessel Act-funded pumpout facilities, of which eight are boats (State of Massachusetts 2008). The MA Office of Coastal Zone Management has prepared a guide to reducing environmental impacts on the marinas in the Boston area. The guide refers collectively to and advises all facilities engaged in boat keeping, storage, repair, etc., which includes boatyards, yacht clubs, town docks and ramps, and other marine businesses (Epsilon Assoc 2001).

Involvement in Northeast Fisheries[60]

Commercial

"While fishing-related business is dwarfed by some of the others, it is significant not only for its role as a component of Boston's economy, but also for its importance in serving dispersed, smaller communities that are more obviously dependent upon fishing and fishing-related businesses… The importance of Boston to the New England region is very significant, in that it is a nexus for the international transshipment of fishery products throughout New England… The twenty or more brokers in Boston service hundreds of boats up and down the coast…. Vessels offload fish at the nearest convenient dock, it's trucked to Boston, and from there is absorbed by regional, national and international markets" (Hall-Arber et al. 2001).

Between 12 and 15 fishing vessels dock at the Boston Fish Pier each day. More than 23 million pounds of fish are processed at the Fish Pier each year, of which 8 million come from the fishing vessels which dock here

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60In reviewing the commercial landings data several factors need to be kept in mind. 1) While both federal and state landings are included, some states provide more detailed data to NMFS than others. For example, shellfish may not be included or data may be reported only by county and not by port. 2) Some communities did not have individual port codes until more recently. Before individual port codes were assigned, landings from those ports were coded at the county level or as an aggregate of two geographically close small ports. Where landings were coded at the county level they cannot be sorted to individual ports for those earlier years, e.g., prior to 2000. 3) Where aggregated codes were used, those aggregate codes may still exist and be in use alongside the new individual codes. Here the landings which are still assigned to the aggregate port code cannot be sorted into the individual ports, so port level data are only those which used the individual port code. 4) Even when individual port codes exist, especially for small ports, landings may be coded at the county level. Here again it is impossible to disaggregate these to a port level, making the port level landings incomplete. 5) In all these cases, the per port data in this profile may under report the total level of landings to the port, though all landings are accounted for in the overall NMFS database.

(BHA 2004). Many fishermen also fish from the Cardinal Medeiros pier in South Boston. The port agent here noted that Boston is home to some of the best-maintained vessels in the country.61

The landings show that large-mesh groundfish were the most valuable fishery in Boston, followed by monkfish and lobster (Table 1). While the value of landings in the groundfishery was less in 2006 than the 1997-2006 average, the value of both lobster and monkfish to Boston fishermen increased. In 2007 Boston was 4th of nine ports showing revenue from skate in excess of $100,000 and 6th of fifteen ports showing landings from skate in excess of 100,000lbs.

There are far more vessels with their home port in Boston than there are vessel owners in Boston, indicating that most fishermen docked in Boston harbor live elsewhere (Table 2). This is true of the skate fishery, where 37 vessels with skate permits list Boston as homeport, but none list it as owner's town of residence. The landings values for both home port and landed port varied over the period from 1997-2006, with no significant pattern. The landed port value exceeded the home port value in every year, meaning some fishermen come from elsewhere to land their catch here.

Landings by Species

Table 1. Rank Value of Landings for Federally Managed Groups

	Rank Value of Average Landings from 1997-2006
Largemesh Groundfish62	1
Monkfish	2
Lobster	3
Other63	4
Squid, Mackerel, Butterfish	5
Skate	6
Scallop	7
Herring	8
Summer Flounder, Scup, Black Sea Bass	9
Smallmesh Groundfish64	10
Bluefish	11
Dogfish	12
Tilefish	13

(Note: Only rank value is provided because value information is confidential in ports with fewer than three vessels or fewer than three dealers, or where one dealer predominates in a particular species and would therefore be identifiable.)

Vessels by Year

Table 17. Federal Vessel Permits Between 1997-2006[65]

Year	# Vessels (home ported)	# Vessels (owner's city)
1997	66	16
1998	49	10

61 Profile review comment, Caleb Gilbert, Port Agent, February 8, 2008.
62 Largemesh groundfish: cod, winter flounder, yellowtail flounder, American plaice, sand-dab flounder, haddock, white hake, redfish, and pollock
63 "Other" species includes any species not accounted for in a federally managed group
64 Smallmesh Multi-Species: red hake, ocean pout, mixed hake, black whiting, silver hake (whiting)
65 Numbers of vessels by owner's city and homeport are as reported by the permit holder on permit application forms. These may not correspond to the port where a vessel lands or even spends the majority of its time when docked.

1999	45	8
2000	37	10
2001	42	9
2002	45	9
2003	42	9
2004	43	9
2005	46	8
2006	46	7

(Note: # Vessels home ported = No. of permitted vessels with location as homeport,
 # Vessels (owner's city) = No. of permitted vessels with location as owner residence66)

Recreational

Fishing charters can be found at the Boston Harbor Shipyard and Marina. Flying Fish Charters is one charter company that runs fishing trips in and around Boston. Recreational fishermen can buy bait, tackle, and fuel at Eric's Bait and Tackle at the Boston Harbor Shipyard and Marina. The Boston Harbor Islands are a popular fishing spot, and are one of the few places in Boston that offer sportfishing year round.

Subsistence

Information on subsistence fishing in Boston was either unavailable through secondary data collection or the practice does not exist. However, this activity most likely exists, although the level of subsistence fishing is difficult to measure. Recent Census data show a 7.5% increase in the Asian population in Boston between 1990 and 2000, also indicating that these new arrivals are considered working poor. Due to language barriers, it has been noted a challenge to make these populations aware of environmental health issues such as shellfish disease. According to Boston Harbor Association's Shellfish Guide and associated report, it is common to see many Asians fishing and harvesting shellfish along Boston Harbor. The seafood makes its way to Chinatown and neighboring towns, where it is often sold on Sundays from the backs of trucks. Health officials have noted an increase in food-borne illnesses in Boston, including in Chinatown. The Harbor Association has developed a project, funded by the MA Environmental Trust, to work with the Asian community to educate and ensure shellfish is being taken from safe areas.67

Future

Plans for the Future

A team of business people is looking at the possibility of developing a 500,000 sq. ft. seafood market and processing complex in unused areas of the South Boston waterfront. The facility would house processing, packaging, cold storage, selling, and shipping, and could create hundreds of jobs. A spokesperson for the project called it "the last best chance to keep the fishing industry in Boston;" they intend to make Boston into the fresh seafood capital of the East Coast (Palmer 2005). Massport has dedicated 10 acres of the Massport Maritime Terminal for seafood processing facilities, to complement existing facilities at the Boston Fish Pier and the Boston Seafood Center (Massport 2005).

The Center for Community Economic Development has created the Seaport Community Access Project which is working to promote the participation of people of color in the Seaport development process and ensure they

66 The Owner-City from the permit files is technically the address at which the owner receives mail concerning their permitted vessels, which could reflect the actual location of residence, the mailing address as distinct from residence, owner business location, or the address at which a subsidiary receives mail about the permits.
67 Community Review Comments, John Valliere, The Boston Harbor Association, Shellfish Guide, September 28, 2007

can have a share in long-term economic benefits from the project. This project is likely to create thousands of jobs in the next decade (Gaston Institute 2003).

Perception of the Future

Judging by the amount of development planned for the waterfront, and relating to the seafood industry, it is clear that at least many in the business community are optimistic about the future of Boston as the seafood capital of New England. However, as this development is going towards infrastructure such as processing and wholesale, and not towards maintaining a fishing fleet here, it also seems that Boston will continue to shift away from being a fishing community, and more towards becoming a hub of seafood distribution. The Conservation Law Foundation recently sued Massport over their failure to maintain the Boston Fish Pier; CLF claims "the ability of the fishing industry to land fish directly in Boston makes the survival of a working Fish Pier critically important to the future of this industry and the viability of Boston's small but important commercial fishing fleet (Conservation Law Foundation 2004)."

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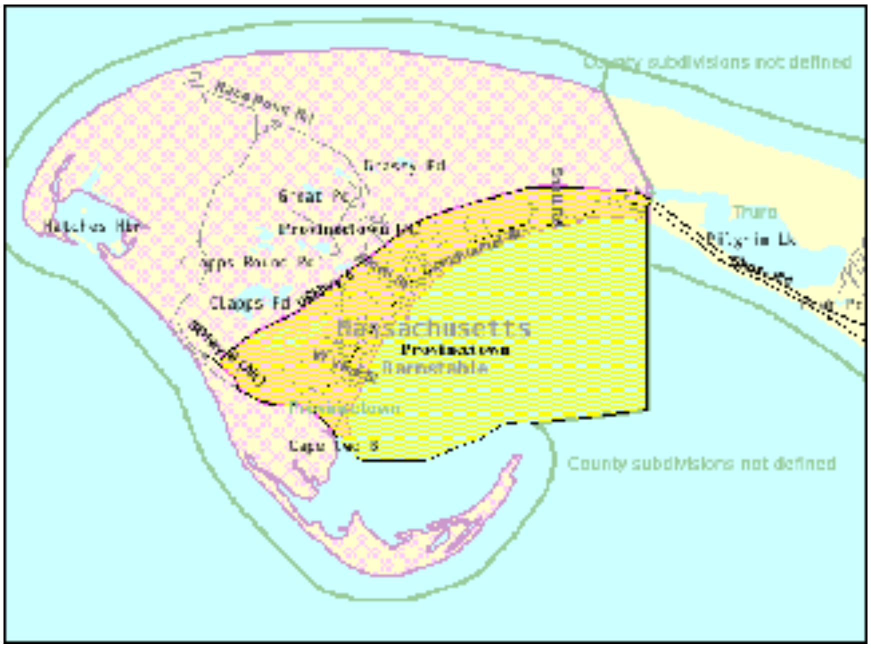
d. PROVINCETOWN, MA[68]

Community Profile[69]

People and Places

Regional orientation

Provincetown is located on the northern tip of the Cape Code peninsula in Barnstable County in the state of Massachusetts. It is bordered by Truro on the east and surrounded by the Atlantic Ocean on all other sides (USGS 2008).



Map 1. Location of Provincetown, MA

Historical/Background

Provincetown harbor is the site of the first landing of the Mayflower, and is also where the Pilgrims signed the Mayflower Compact. The first permanent settlement did not take place until 1700 and by 1727, the town was incorporated.

Provincetown grew slowly during the 18th century and the resident population fluctuated with the price of fish. As whaling came of age in New England, Provincetown experienced a sudden transition from a quiet fishing village to a bustling whaling port. By the mid 1800s, Provincetown, with the largest and safest natural harbor on the New England coast, had become one of the busiest seaports in the country (Hall-Arber et al. 2001). During this time there were many fishing and salt drying businesses in town. Without good soil for agriculture, the town depended on its salt, fishing and fish drying industry.

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68 These community profiles have been created to serve as port descriptions in Environmental Impact Statements (EISs) for fisheries management actions. They also provide baseline information from which to begin research for Social Impact Assessments (SIAs). Further, they provide information relevant to general community impacts for National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and information on minorities and low income populations for Executive Order (E.O.) 12898 on Environmental Justice.

69 For purposes of citation please use the following template: "Community Profile of *Town, ST*. Prepared under the auspices of the National Marine Fisheries Service, Northeast Fisheries Science Center. For further information contact Lisa.L.Colburn@noaa.gov."

According to the study conducted by the Massachusetts Department of Housing and Community Development, “In 1875, there were 25 coast-wide and 36 ocean vessels operating in town, more than any community in the state including Boston. Provincetown was a bustling place with all of the ancillary maritime businesses operating, such as ship chandlers, shipwrights, sail makers, caulkers, riggers and blacksmiths. The picturesque setting and salt air also began attracting artists and writers by the end of the 19th century. When the fishing industry faltered from competition with cheaper Nova Scotia cod, and the Portland Gale of 1898 swept away half of the town's wharves, the resort population of the town provided jobs to take the place of those lost. Today, the wealth of preserved historic buildings combines with the lure of the sea to support a huge tourist and summer home industry (State of Massachusetts 2007).”

Demographics[70]

According to Census 2000 data (US Census Bureau 2000), Provincetown CDP had a total population of 3,192, down 5.4% from the reported population of 3,374 in 1990 (US Census Bureau 1990). Of the year-round residents, 53.8% were males and 46.2% were female. The median age is 45.4 years and 92.4% of the population is 18 years or older while 18.3% are 65 or older.

Provincetown’s age structure by sex (see Figure 1) shows that the male population between the ages of 30 and 69 years are much higher than the females in these ages. This is most likely due to the gay male population that has taken residence in Provincetown. During the summer months, the overall population of Provincetown can increase to nearly 19,000 (Provincetown VSB 2007).

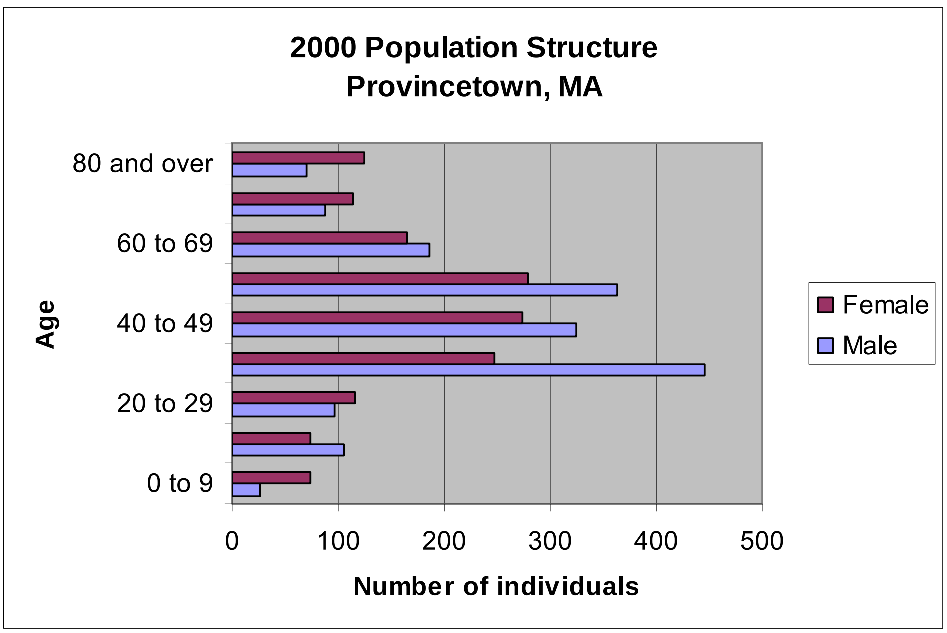

Figure 1. Provincetown CDP's population structure by sex in 2000

The majority of the population was white (87.4%), with 7.8% of the residents black or African American, 0.6% Asian, 0.8% Native American, and none Pacific Islander or Hawaiian (see Figure 2). Only 2.1% of the population identified themselves as Hispanic/Latino (see Figure 3). Residents linked their backgrounds to a number of different ancestries including: Portuguese (21.4%), Irish (14.7%), and English (10.7%). With regard to region of birth, 45.4% were born in Massachusetts, 45.6% were born in a different state, and 7.2% were born outside of the U.S. (including 5.8% who were not United States citizens).

70 While mid-term estimates are available for some larger communities, data from the 2000 Census are the only data universally available for the communities being profiled in the Northeast. Thus for cross-comparability we have used 2000 data even though these data may have changed significantly since 2000 for at least some communities.

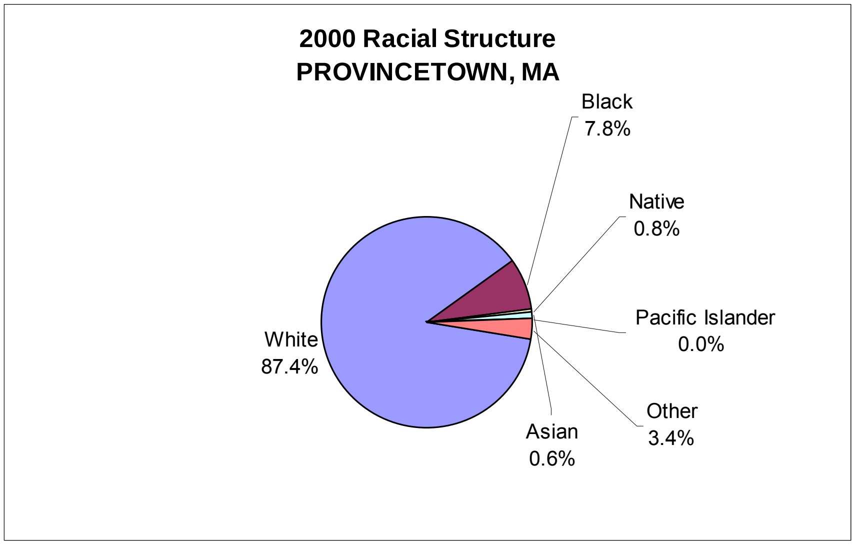

Figure 2. Racial Structure in 2000 (US Census Bureau 2000a)

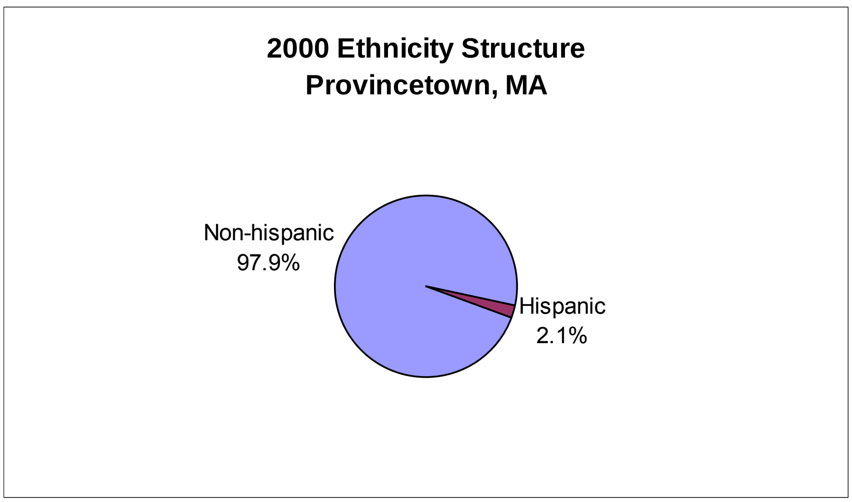

Figure 3. Ethnic Structure in 2000 (US Census Bureau 2000a)

For 91.8% of the population, only English was spoken in the home, leaving 8.2% in homes where a language other than English was spoken, including 8.2% of the population who spoke English less than 'very well' according to the 2000 Census.

Of the population 25 years and over, 85.1% were high school graduates or higher and 38.1% had a bachelor's degree or higher. Again of the population 25 years and over, 3.5% did not reach ninth grade, 11.4% attended some high school but did not graduate, 23.2% completed high school, 15.1% had some college with no degree, 8.6% received an associate's degree, 22.9% earned a bachelor's degree, and 15.2% received either a graduate or professional degree.

Although religion percentages are not available through U.S. Census data, according to the Association of Religion Data Archives (ARDA) in 2000, the religion with the highest number of congregations and adherents in Barnstable County was Catholic with 29 congregations and 89,000 adherents. Other prominent congregations in the county were Episcopal (11 with 8,028 adherents), and Baptist (7 with 1,387 adherents). The total number of adherents to any religion was down 20.7% from 1990 (ARDA 2000).

Issues/Processes

One of the biggest controversies in Provincetown in the past few years has been the reconstruction of the MacMillan Wharf. The community disagreed on the plans in 2000, but the construction began in 2001. Floating docks added to the wharf were damaged in the first Nor'easter after installation due to design flaws and have since been replaced with a better design. After the wharf was reconstructed, the town created the Provincetown Public Pier Corporation (PPPC). The first several years after the Town seated the PPPC Directors were contentious. The PPPC increased dock rates; excursion businesses sued PPPC over rate increases and lost in court. The fishers did not trust the PPPC to protect their interests and used the political climate to try to dissolve the corporation. The outcome of three-way negotiations between the fishers' organization- ProFish, PPPC and the Board of Selectmen resulted in a reduced or protected rate for the fishers of about half ($2000 per average boat in 2005) the market rate with an annual consumer price index modifier. PPPC also completed a long stalled ice plant and delivery system for the fishing fleet undercutting New Bedford delivered ice prices.71

Cultural attributes

Provincetown celebrates its heritage with a culmination of events over one weekend. The town hosts the annual Blessing of the Fleet (started in 1948) and the Provincetown Portuguese Festival the last weekend of June. This year the activities were held from June 24th to the 27th. In 2004, the Blessing of the Fleet was the 57th Annual, with the parade held on Saturday and the Blessing took place on Sunday. Throughout the weekend, Portuguese foods, traditions and dance are celebrated. In 2007, the Blessing of the Fleet celebrated its 60th year. The combined events of Portuguese Festival and Blessing were the largest in decades.

A second cultural event was created six years ago to celebrate the heritage of fishing schooners in Provincetown. The Great Provincetown Schooner Regatta and yacht race drew over a dozen schooners to the 2007 event the weekend after Labor Day. In 2008, the event will expand to include a fishermen's cup race from Gloucester to Provincetown commemorating the fishing Schooner Rose Dorothea's win in 1907 of the Lipton Cup. Even today, the synergy between the Arts Colony and commercial fishing flourishes. The artists are drawn to the colors and lines of the vessels and gear. Plays and performances involve the lives and lore of fishing on the outer cape. Fishermen still supply the less fortunate with some of their catch (Town of Provincetown 2007).

Infrastructure

Current Economy

The majority of businesses in Provincetown cater to tourists and art buyers. The year round employers that have the most employees are the Town Hall and the Outer Cape Health Services, according to the Town Clerk office in Provincetown.72 Summer businesses hire employees for retail and other seasonal jobs.

According to the U.S. Census 200073, 64.2% (1,921 individuals) of the total population 16 years of age and over were in the labor force (see Figure 4), of which 13.1% were unemployed, 0.8% were in the Armed Forces, and 50.3% were employed.

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71 Profile review comment, Rex McKinsey, Provincetown Harbormaster, October 2, 2007

72 Personal communication by JE 2005

73 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

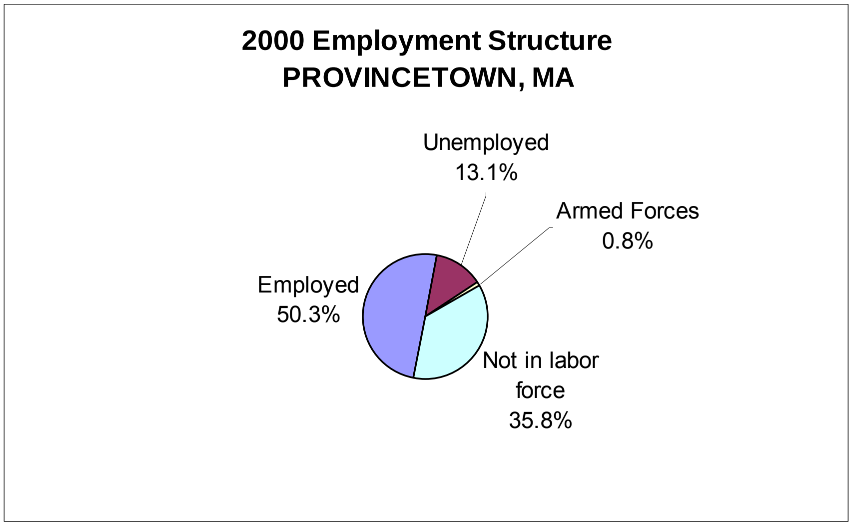

Figure 4. Employment structure in 2000 (US Census Bureau 2000a)

According to Census 2000 data, jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 15 positions or 1.0% of all jobs. Self employed workers, a category where fishermen might be found, accounted for 241 positions of 16.0% of jobs. Arts, entertainment, recreation, accommodation and food services (23.7%), educational, health and social services (17.1%), and retail trade are the primary industries (14.2%).

Median household income in Provincetown was $32,731 (1990 data was unavailable) and median per capita income was $26,878. For full-time year round workers, males made approximately 16.5% more per year than females.

The average family in Provincetown consisted of 2.62 persons. With respect to poverty, 8.7% of families (1990 data was unavailable) and 15.5% of individuals earned below the U.S. Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families, depending on number of persons (2-9) (US Census Bureau 2000b). In 2000, 40.5% of all families (of any size) earned less than $35,000 per year.

In 2000, Provincetown had a total of 3,719 housing units, of which 46.5% were occupied and 36.3% were detached one unit homes. Approximately one half (57.3%) of these homes were built before 1940. Mobile home accounted for no housing units; 51.8% of detached units had between 2 and 9 rooms. In 2000, the median cost for a home in this area was $333,100. Of vacant housing units, 47.6% were used for seasonal, recreational, or occasional use. Of occupied units, 27.2% were renter occupied.

Government

Provincetown is governed by a Board of Selectmen, a Town Manager, and open Town meetings (State of Massachusetts 2007).

Fishery involvement in government

The town has a Harbormaster. In addition, the town approved the Municipal Harbor Plan which outlines future use and management of Provincetown Harbor. Five key issue areas addressed in this plan, include: “preserving the Harbor's Built and Natural Assets; promoting Commercial Fishing and Aquaculture; providing for Diverse Vessel Use and Needs; assuring Public Access to the Shoreline for Recreation; and planning for Future Harbor Uses (Town of Provincetown 2007).”

With the reconstruction of MacMillan Pier, the Town created Provincetown Public Pier Corporation (PPPC). An amendment to the enabling legislation added protection of commercial fishing interests to the original charge of redeveloping MacMillan Pier for economic development and to bring dock rates in line with market forces, allowing the pier to pay the Town share of the reconstruction debt ($3.8 million) and maintain the facility. Under the Board of Selectmen, dock rates had not changed for either the fishing fleet or the excursion businesses on the pier since 1986 and the pier had decayed. PPPC pursued rate increases using regional surveys of other ports to determine market rates.74

Institutional

Fishing associations

PROFISH, Provincetown Fishermen's Association, allied with Northwest Atlantic Marine Alliance in 2002. The association has a nine-member Board of Directors and approximately 60 members. Fishermen formed this organization in order to represent themselves in town meetings regarding the reconstruction of the town pier. Currently ProFish is a silent partner in the management of MacMillan Pier with the harbormaster's office serving as liaison between the fishers and the PPPC directors. Both entities have a keen interest in ensuring revenue to the pier from other sources.75

The Massachusetts Fisherman's Partnership focuses on issues for fishermen in different ports in Massachusetts. The Partnership responded to the need of health care for fishermen and their families by developing the Fishing Partnership Health Insurance Plan with federal and state aid. This plan has been in place since 1997 and reduces the amount of money that fishermen's families have to pay to be covered by health insurance (Hall-Arber 2001).

Fishing assistance centers

Information on fishing assistance centers in Provincetown is unavailable through secondary data collection.

Other fishing related organizations

The Center for Coastal Studies, founded in 1976, is located in Provincetown. This non-profit organization works to conduct research on marine mammals and coastal ecosystems, and provide educational services to the surrounding communities about marine conservation.

Physical

Provincetown is 49 miles north of Hyannis, 78 miles east of Plymouth, 114 miles southeast of Boston, and 290 mile from New York City (MapQuest nd). The city's principal highways are U.S. Route 6, the Mid Cape Highway, and State Route 6A. There is no freight rail service, but the network of inter-modal facilities serving Eastern Massachusetts and Rhode Island is easily accessible. Provincetown is a member of the Cape Cod Regional Transit Authority (CCRTA), which operates a b-bus demand response service. The b-bus is convenient, low-cost public transportation from one's home on Cape Cod and back. The Cape Cod Regional Transit Authority provides this door-to-door, ride-by-appointment service for people of all ages for trips for any purpose. B-buses carry up to 19 passengers and are all lift-equipped. The Plymouth and Brockton Street Railway Company provides two trips daily between Provincetown and Boston.

The Provincetown Municipal Airport is a Commercial Service (CM) facility located two miles northwest of town. The Plymouth and Brockton Street Railway Company provides two bus trips daily between Provincetown and Logan Airport (State of Massachusetts 2007).

Fishing infrastructure in Provincetown is based around MacMillan Wharf. The PPPC staff at MacMillan Wharf maintains three jib cranes for the fishers use to offload their catch. They also recently completed an ice plant and ice delivery system. Currently, catch volume does not support renting deck space to offloaders. Instead, the fishers move product directly to their own or buyer trucks for transport to market. 76

74 Profile review comment, Rex McKinsey, Provincetown Harbormaster, October 2, 2007
75 Profile review comment, Rex McKinsey, Provincetown Harbormaster, October 2, 2007
76 Profile review comment, Rex McKinsey, Provincetown Harbormaster, October 2, 2007

D. INVOLVEMENT IN NORTHEAST FISHERIES77

Commercial

The fishing industry in Provincetown is no longer the mainstay of the community's economy; however, it does provide a sense of culture and is making an effort to stay afloat during times of low catches and strict regulations. On average from 1997-2006, largemesh groundfish were the most valuable species grouping landed in Provincetown, with just over $1 million in landings on average (see Table 1). However, by 2006 the landings of groundfish had declined, while landings of both lobster and scallops had increased from the ten-year average values, each valued at over $1 million. Overall, Provincetown saw its highest landings in 2001, with over $5.6 million landed in that year. Subsequent years saw a drop in value, with an increase again in 2005 to $4.8 million (see Table 2). The level of fishing for home ported vessels mimicked the trend in landings, but was lower for every year, indicating that some vessels from other ports are landing their catch in Provincetown. The number of home ported vessels generally declined, from 45 in 1997 to 27 in 2006.

The current count of commercial fishing vessels today at Provincetown Harbor, according to the Harbormaster is: 14 draggers over 50 feet, of which 12 operate regularly; eight dragger/flex-boats under 50 feet; and at least 35 lobster boats. Provincetown has seen a trend toward smaller vessels rigged to take advantage of changing conditions and the proximity of the fishing grounds. The smaller vessels require less crew and fuel to operate, can get out and back quicker and rigging is easily changed to adjust to seasonal fluctuations of product.78

With regard to skate, Provincetown is listed as homeport on 0.8% of skate permits and as vessel owner's residence on 0.4%. It is the 9th largest port of landing for skates in the Northeast, accounting for 166,160lbs and $103,502 in 2007. These levels account for 12% of all pounds of fish landed in Provincetown and 3% of all ex-vessel revenues, making Provincetown 6th in poundage dependence and 4th in dollar dependence in the region. There are 6 dealers in Provincetown. Given that Provincetown is both a bait skate and a food skate port, some of these dealers many be vessels which have a dealer license in order to sell bait to local lobster and other pot fishermen.

Landings by Species

Table 1. Dollar value of Federally Managed Groups by species landed in Provincetown

	Average from 1997-2006	2006 only
Largemesh Groundfish79	1,003,894	696,612
Lobster	894,127	1,297,060
Scallop	705,648	1,115,703

77 In reviewing the commercial landings data several factors need to be kept in mind. 1) While both federal and state landings are included, some states provide more detailed data to NMFS than others. For example, shellfish may not be included or data may be reported only by county and not by port. 2) Some communities did not have individual port codes until more recently. Before individual port codes were assigned, landings from those ports were coded at the county level or as an aggregate of two geographically close small ports. Where landings were coded at the county level they cannot be sorted to individual ports for those earlier years, e.g., prior to 2000. 3) Where aggregated codes were used, those aggregate codes may still exist and be in use alongside the new individual codes. Here the landings which are still assigned to the aggregate port code cannot be sorted into the individual ports, so port level data are only those which used the individual port code. 4) Even when individual port codes exist, especially for small ports, landings may be coded at the county level. Here again it is impossible to disaggregate these to a port level, making the port level landings incomplete. 5) In all these cases, the per port data in this profile may under report the total level of landings to the port, though all landings are accounted for in the overall NMFS database.

78 Profile review comment, Rex McKinsey, Provincetown Harbormaster, October 2, 2007

79 Largemesh Groundfish: cod, winter flounder, witch flounder, yellowtail flounder, am. plaice, sand-dab flounder, haddock, white hake, redfish, and pollock

	Average from 1997-2006	2006 only
Other80	427,874	424,756
Smallmesh Groundfish81	415,437	0
Skate	97,400	86,723
Monkfish	88,245	55,407
Dogfish	47,462	16,482
Summer Flounder, Scup, Black Sea Bass	31,372	49,367
Surf Clams, Ocean Quahog	21,935	0
Bluefish	20,293	7,289
Squid, Mackerel, Butterfish	8,094	0
Herring	9	0

Vessels by Year82

Table 2. All columns represent vessel permits or landed value combined between 1997-2006

Year	# Vessels (home ported)	# Vessels (owner's city)	Level of fishing home port ($)	Level of fishing landed port ($)
1997	45	30	1,836,160	2,323,550
1998	41	25	2,082,836	2,806,083
1999	45	28	2,861,104	3,509,414
2000	38	19	2,294,882	3,805,809
2001	40	18	3,745,646	5,648,390
2002	40	19	2,766,302	3,894,188
2003	45	22	2,001,747	3,555,308
2004	45	21	1,941,001	3,477,377
2005	39	15	2,863,492	4,848,370
2006	27	11	1,871,187	3,749,399

(Note: # Vessels home ported = No. of permitted vessels with location as homeport
 # Vessels (owner's city) = No. of permitted vessels with location as owner residence83
Level of fishing home port ($) = Landed value of fisheries associated with home ported vessels
Level of fishing landed port ($) = Landed value of fisheries landed in location)

Recreational

Provincetown's economy thrives on tourism. In 2007, there are at least seven charter fishing/party boat businesses and five whale watching boats located on the town's two piers. Several other charter boats operate off moorings in Provincetown Harbor. Charter boats from around Cape Cod converge on Hatches Harbor between

80 "Other" species includes any species not accounted for in a federally managed group
81 Smallmesh Multi-Species: red hake, ocean pout, mixed hake, black whiting, silver hake (whiting)
82 Numbers of vessels by owner's city and homeport are as reported by the permit holder on permit application forms. These may not correspond to the port where a vessel lands or even spends the majority of its time when docked.
83 The Owner-City from the permit files is technically the address at which the owner receives mail concerning their permitted vessels, which could reflect the actual location of residence, the mailing address as distinct from residence, owner business location, or the address at which a subsidiary receives mail about the permits.

Wood End and Race Point Lights to fish for stripers, bluefish and tuna. Many of these vessels from Rock Harbor and Dennis embark their passengers at Provincetown's Courtesy float.84

Subsistence

Information on subsistence fishing in Provincetown is unavailable through secondary data collection. However, some subsistence fishing is known to occur out of Provincetown.85

e. FUTURE

Both ProFish and the PPPC directors have a keen interest in ensuring revenue to the pier from other sources to maintain its viability. Potential plans for a new building at MacMillan Wharf include offloading and ice services coupled with a revenue source such as fresh fish market, restaurant, public or rental space to support the structure. The new revenues generated by the pier include, special events, large yacht tie-up and "trapsheds" for rent to artists. The contracts created for PPPC management of the pier include protections and enhancements for the commercial fishing fleet. The new revenue from other sources enables those protections.

The Provincetown harbormaster notes: "the prognosis for the Provincetown fleet depends on the regulators. If the trend toward regulating a few large factory ships continues, the result for small ports across the Northeast is dire."86

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84 Profile review comment, Rex McKinsey, Provincetown Harbormaster, October 2, 2007
85 Profile review comment, Rex McKinsey, Provincetown Harbormaster, October 2, 2007
86 Profile review comment, Rex McKinsey, Provincetown Harbormaster, October 2, 2007

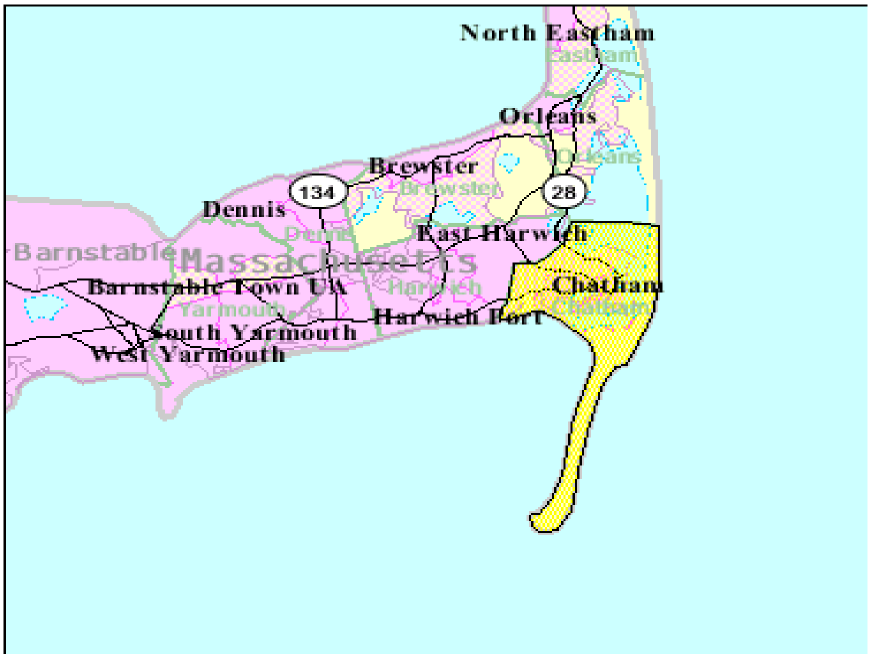
e. CHATHAM, MA[87]

Community Profile[88]

F. PEOPLE AND PLACES

Regional Orientation

Chatham, Massachusetts is located at the southeastern tip of Cape Cod in Barnstable County, approximately 89 miles from Boston. To the east is the Atlantic Ocean, to the south is Nantucket Sound, and to the north is Pleasant Bay. The only adjacent town (located at both the north and west town line boundaries) is Harwich. Major geographical features of the town are hills, wooded uplands, extensive barrier beaches and spits, harbors, numerous small estuaries, and salt and freshwater ponds (Town of Chatham nd).



Map 1. Location of Chatham, MA (US Census Bureau 2000)

Historical/Background

Chatham was an English settlement in the mid 1600s. William Nickerson, a name that is still prominent in the town today, acquired nearly the entire town's area at that time. Because of Chatham's geography and lack of developed transportation, the town's economy and living conditions were vulnerable to warships. The population began to stabilize with the fishing trade, ship building, fishing, and salt making in the mid 18th century. With the building of the railroad in 1887, Chatham quickly became a summer resort destination for wealthy people. By 1950, the summer season population was more than double the year round population. According to the Town of Chatham website, Chatham now receives from 20-25,000 visitors each summer (Town of Chatham nd). Although the cost of

87 These community profiles have been created to serve as port descriptions in Environmental Impact Statements (EISs) for fisheries management actions. They also provide baseline information from which to begin research for Social Impact Assessments (SIAs). Further, they provide information relevant to general community impacts for National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and information on minorities and low income populations for Executive Order (E.O.) 12898 on Environmental Justice.
88 For purposes of citation please use the following template: "Community Profile of *Town, ST*. Prepared under the auspices of the National Marine Fisheries Service, Northeast Fisheries Science Center. For further information contact Lisa.L.Colburn@noaa.gov."

living is increasing in Chatham from the dominant tourism industry, there is still a fishing community using a range of harvest techniques from the more traditional hook and line and weir fishing to the more modern trawling, gillnetting, scalloping, etc., as well as an important shellfishing industry. While the fishing industry exists and is determined to survive through the difficult period of stock depletion and strict fishery regulations, many changes both in and out of the town are putting pressure on the industry.

Demographics89

According to Census 2000 data (US Census Bureau 2000), Chatham had a total population of 1,667, down 12.9% from the reported population of 1,916 in 1990 (US Census Bureau 1990). Of this 2000 total, 52.3% were female and 47.7% were male. The median age was 53.3 years and 86.4% of the population was 18 years or older while 32.5% was 65 or older.

The population structure for Chatham (Figure 1) shows an abnormal age group distribution compared to other small fishing towns in the Northeast. There is a very small percentage of the total population between 30 and 39 years and between 0 and 9 years, but a large number of females between the ages of 40-49. Overall, there are more adults than younger age groups in Chatham and more males than females between the ages of 10-19, 30-39 and 60-69. This larger portion of males in these age groups may indicate fishermen working out of Chatham.

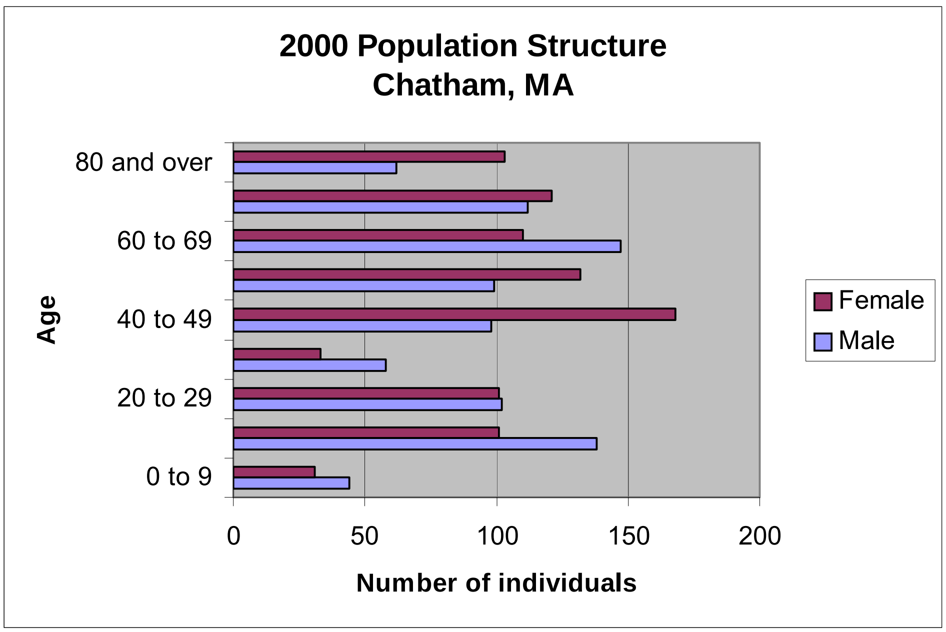


Figure 1. Chatham's Population Structure by sex in 2000 (US Census Bureau 2000)

The majority of the population was white (95.2%), with 2.2% of residents black or African American, 0.3% Asian, 0.2% Native American, and none Pacific Islander or Hawaiian (Figure 2). Only 1.9% of the total population identified themselves as Hispanic/Latino (see Figure 3). Residents linked their backgrounds to a number of different ancestries including: Irish (27.5%), English (26%), German (6.5%), and Italian (6.8%). With regard to region of birth, 54.3% were born in Massachusetts, 36.4% were born in a different state and 8.8% were born outside of the United States (including 4.1% who were not United States citizens).

89 While mid-term estimates are available for some larger communities, data from the 2000 Census are the only data universally available for the communities being profiled in the Northeast. Thus for cross-comparability we have used 2000 data even though these data may have changed significantly since 2000 for at least some communities.

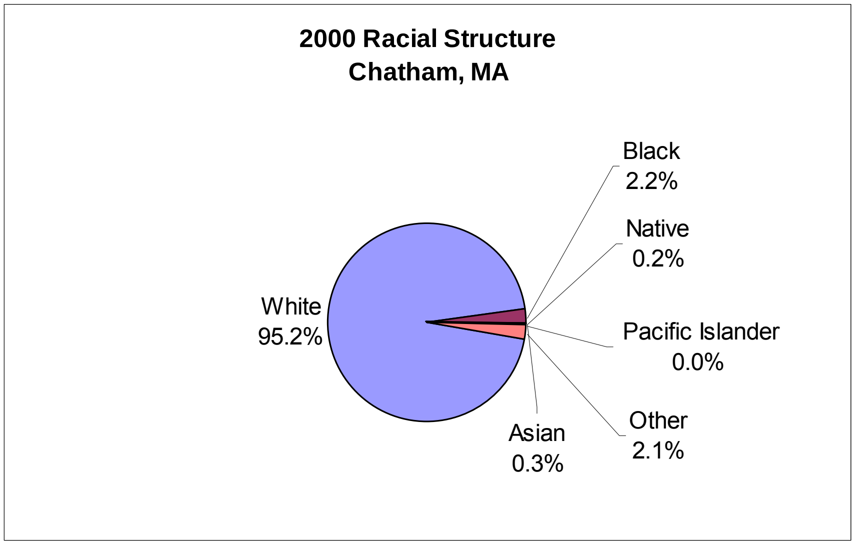


Figure 2. Chatham's Racial Structure in 2000 (US Census Bureau 2000)

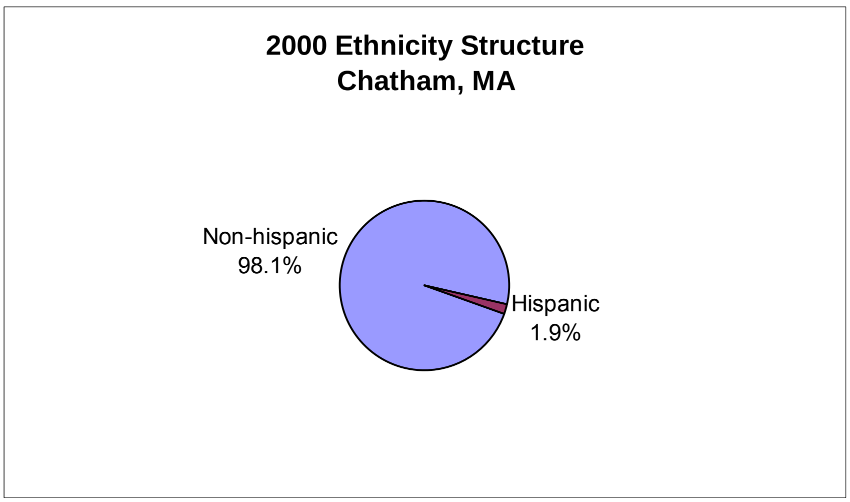


Figure 3. Chatham's Ethnic Structure in 2000 (US Census Bureau 2000)

For 95.1% of the population, only English was spoken in the home, leaving 4.9% in homes where a language other than English was spoken, including 2.9% of the population who spoke English less than 'very well' according to the 2000 Census.

Of the population 25 years and over, 89.9% were high school graduates or higher and 45.1% had a bachelor's degree or higher. Again of the population 25 years and over, 5.0% did not reach ninth grade, 5.1% attended some high school but did not graduate, 22.2% completed high school, 14.1% had some college with no degree, 8.4% received their associate's degree, 32.8% earned their bachelor's degree, and 12.3% received either their graduate or professional degree.

Although the religion percentages are not available through U.S. Census data, according to the Association of Religion Data Archives (ARDA) in 2000, the religion with the highest number of congregations in Barnstable County was Catholic with 29 congregations and 89,000 adherents. Other prominent congregations in the county were Episcopal (11 with 8,028 adherents) and Baptist (7 with 1,387 adherents). The total numbers of adherents to any religion was down 20.7% from 1990 (ARDA 2000).

Issues/Processes

Information gathered during a visit to the Cape Cod Commercial Hook Fishermen's Association (CCCHFA) in 2004 revealed that the fishing industry in Chatham faces similar challenges to other fishing port communities in the Northeast. With tourism and the increase of gentrification, the fishing industry is threatened by a lack of mooring space and the threat of land-based fishing infrastructure closing down. At the same time many believe that the history of fishing has been a large part of the allure that draws tourists to Chatham, so it could lose its cultural appeal if the fisheries really did fade away. With a group such as the CCCHFA, the fishermen appear to be fighting the challenges of stricter catch regulations and decreased catches by finding alternative ways to keep their fishing industry alive. Also refer to section "Fisheries involvement in the government" for more information on CCCHFA sector allocation.

The Cape Cod Regional Economic Development Council (CCREDC) has not recognized the importance of commercial fishing on Cape Cod, however; they rely on census data which hides fishermen's incomes in the self employment and agricultural categories. Melissa Weidman of CCCHFA estimated that there are 10,000 fishermen on Cape Cod, while the CCREDC reported only 50 fishermen. One example of an important business to fishing in Chatham is Cape Fish Supply. It is the biggest supplier for the entire Cape. People come here from Provincetown with the next biggest supplier in New Bedford.90

The Town of Chatham has made many significant financial investments in the commercial fishing industry. In early 2006, the taxpayers invested $1 million in the Chatham Municipal Fish Pier. The Town dredges the channel and the harbor at the fish pier twice a year due to the constant shifting shoals in the area.91

There is controversy over the harvesting of shellfish in the National Seashore Wilderness Sanctuary (Monomoy). Some people are trying to organize against the extraction of shellfish in this area. This is the most important shellfishery in New England. A few years ago Chatham had $4.5 million industry from shellfish, while the entire state of Maine had only $9 million. The process of turning the clam beds (a result of extraction) actually releases sulfates from the soil producing a more conducive environment for other creatures, including more shellfish.92

Amendment 3 to the Skate Plan is generating a lot of discussion among gillnetters and dealers. The potential closures are seen as a death knell to the Chatham skate fishery, as the closures are in the main areas which Chatham fishermen fish. Moving out of those areas would be too expensive and also require fishing side-by-side with trawls which would generate gear conflicts. Chatham originally switched to skates because they were said to be underutilized and because groundfish and monkfish regulations were becoming stricter. This fleet has traditionally fished a variety of species, but they are having more and more trouble fitting together a year's worth of fishing93.

Cultural attributes

The Cape Cod Commercial Hook Fishermen's Association plays a major role in the Chatham community. Each year they host their annual Hookers Ball gala in the summer. The event's proceeds help support the work of the grassroots sustainable fishery organization. The CCCHFA also started a Chatham Fish Pier Program, where local retired fishermen explain details about the boats as they unload their catch. Another way the community remembers its maritime history is through the Chatham Maritime Festival, which celebrates Chatham's maritime heritage with an exciting day of contests, races and a fishing parade. There are web cams (TeleCAM) for the Chatham fish pier and Stage Harbor, where visitors can go online to view boat activity and get panorama's of the harbor. The TeleCAMs are updated every half hour from sunrise to sunset.

90 pers. com. Melissa Roberts Weidman, August 2004

91 Profile review comment, Susan Rocanello, Chatham Assistant Harbormaster, September 12, 2007

92 pers. com. Bob XX during Chatham field visit, August 4, 2004 with JE, PS, and LS.

93 Pers. com. 3 Chatham skate gillnetters and Eric Brazer of the CCCHA, October 29, 2008. Pers com. Dave Carnes, owner, Chatham Fish and Lobster, November 5, 2008.

G. INFRASTRUCTURE

Current Economy

The economy of Chatham drives the population fluctuation as tourists and seasonal residents come in and out for the summer. Representative of this is the fact that the two businesses in Chatham that employ the most people are summer resorts (Chatham Bars Inn and Chatham Wayside Inn). Chatham Bars Inn, established in 1914, is the largest employer in Chatham with approximately 200 year-round employees and 550-600 summer employees. The resort provides housing for some of its seasonal employees, the majority of which are from other countries or are college students.94 Chatham is also notable in that it has "twice the Cape Cod average of self-employed persons, a higher-than-regional average number of fishermen, and more highly valued residential properties" (Town of Chatham nd). Chatham skate dealers include Nantucket Fish and Chatham Fish and Lobster. Chatham Fish and Lobster buys a variety of species from 6-10 local gillnetters and also buys from small skiffs that land elsewhere and drive to his dock in pickups. He also owns a retail business and a restaurant and sells to other retailers and restaurants. In addition he sells to restaurants in New York and Boston95.

According to the U.S. Census 200096, 51.6% of the total population 16 years of age and over were in the labor force (Figure 4), of which 2.0% were unemployed, 2.0% were in the Armed Forces, and 47.6% were employed.

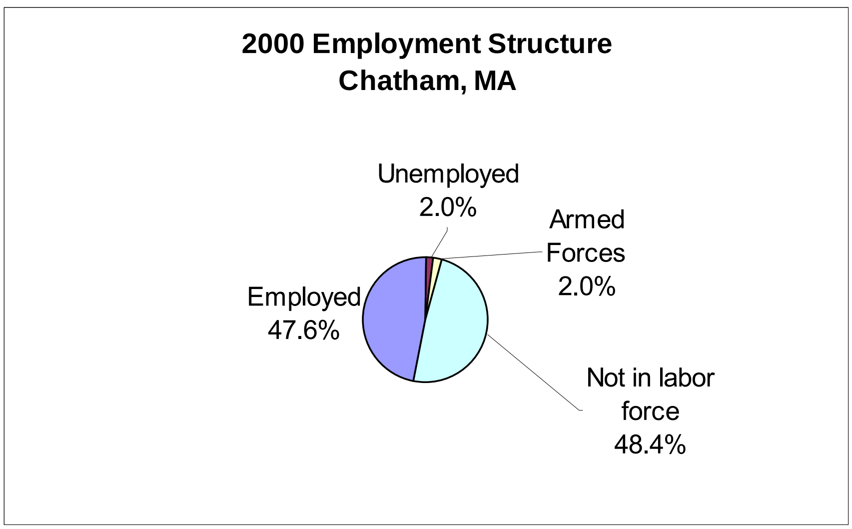


Figure 4. Employment structure in 2000 (US Census Bureau 2000)

According to Census 2000 data, jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 26 positions or 3.6% of all jobs. Self employed workers, a category where fishermen might be found, accounted for 122 positions or 16.8% of jobs. Educational, health and social services (19.1%), arts, entertainment, recreation, accommodation and food services (17.9%), retail trade (17.3%), construction (10.7%), and finance, insurance, real estate, and rental and leasing (10.2%) were the primary industries.

Median household income in Chatham was $47,037 (up 76.1% from $26,716 in 1990 [US Census Bureau 1990]) and median per capita income was $28,542. For full-time year round workers, men made approximately 3.3% more per year than females.

The average family in Chatham consisted of 2.52 persons. With respect to poverty, 0.9% of families (down from 9.5% in 1990 [US Census Bureau 1990]) and 7.8% of individuals were below the official U.S. Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families,

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94 pers. comm. Chatham Bars Inn Personnel Manager, August 2004

95 Pers. com. Dave Carnes, owner of Chatham Fish and Lobster, November 5, 2008.

96 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

depending on number of persons (2-9) (US Census Bureau 2000b). In 2000, 23.9% of all families (of any size) earned less than $35,000 per year.

In 2000, Chatham had a total of 1,891 housing units of which 43.1% were occupied and 85.4% were detached one unit homes. Over one third (36%) of these homes were built before 1940. Mobile homes, boats, RVs, and vans accounted for no housing units; 98.9% of detached units had between 2 and 9 rooms. In 2000, the median cost for a home in this area was $372,900. Of vacant housing units, 89.5% were used for seasonal, recreational, or occasional use. Of occupied units 27.2% were renter occupied.

Government

The town of Chatham was incorporated as a town in 1730. The town is operated by a Town Manager, a Board of Selectmen, and an Open Town Meeting (Town of Chatham 2007).

i.Fishery involvement in government

The Town owns and operates a shellfish upwelling system in Stage Harbor as part of their shellfish program.[97] They also have a harbor master's office.

NOAA Fisheries, Fisheries Statistics Office, has a port agent based off Main Street in Chatham. Port agents sample fish landings and provide a 'finger-on-the-pulse' of their respective fishing communities.[98]

ii.Institutional

Fishing associations

The Chatham maritime community is supported by the Cape Cod Commercial Hook Fishermen's Association (CCCHFA). The association began in 1993 with a small group of commercial hook and line fishermen who got together to discuss problems in the industry. Their purpose is to address problems by building sustainable fisheries for the future, and representing the traditional fishing communities. One of the programs that the CCCHFA created is the S.S. Shanty Community Fisheries Action Center (CCCHFA 2005). They also spearheaded the creation of and received the first sector allocation for the groundfish fishery (Plante 2004). This initiative has encouraged other sectors to form in the area and region. The purpose of the Action Center is to empower fishermen, educate concerned residents, and facilitate collaboration between conservation, fishing and community organizations to generate a more active and effective marine community on Cape Cod (CCCHFA 2005).

Two Sector groups have developed out of the CCCHFA: the Georges Bank Cod Hook Sector (begun in 2004) and the Georges Bank Fixed Gear Sector (begun in 2006). Sectors are a relatively new management form becoming more popular in New England, with a number of sectors expected to be in place by 2010.

The Massachusetts Fisherman's Partnership focuses on issues for fishermen in different ports in Massachusetts. The Partnership responded to the need of health care for fishermen and their families by developing the Fishing Partnership Health Insurance Plan with federal and state aid. This plan has been in place since 1997 and reduces the amount of money that fishermen's families have to pay to be covered by health insurance (Hall-Arber et al. 2001).

1. Fishing assistance centers

No fishing assistance centers that provide monetary support were identified in Chatham during this research; however, the CCCHFA could be classified as an assistance center.

2. Other fishing-related organizations

97 Profile review comment, Stuart Smith, Harbormaster, September 19, 2007

98 http://www.nero.noaa.gov/fso/ Click on Field Offices. (accessed February 8, 2007)

Hook and line fishermen of Cape Cod established the CCCHFA in 1993. This grassroots organization now has 2,500 members and several programs to support Cape Cod traditional maritime communities and increase awareness about the fishing culture in the area. Another organization that is vital to the Chatham community is the Friends of Chatham Waterways. The association has an interest in the broader municipal issues that may have an impact on Chatham's maritime heritage or upon the natural environment of the community.

Physical

Chatham is 17 miles east of Hyannis, 89 miles southeast of Boston, and 223 miles away from New York City (State of Massachusetts 2007). Chatham is supported by the State Routes 28 and 137. There is no freight rail service, but the network of intermodal facilities serving eastern Massachusetts and Rhode Island is easily accessible. Chatham is a member of the Cape Cod Regional Transit Authority (CCRTA), which operates a b-bus demand response service. The b-bus is a convenient, low-cost public transportation system, picking residents up at their homes on Cape Cod. The CCRTA provides this door-to-door, ride-by-appointment service for people of all ages for trips for any purpose, including school, work, shopping, college, doctor's appointments, visiting friends and even Boston medical trips. B-buses carry up to 19 passengers and are all lift-equipped. The Chatham Municipal Airport is a General Aviation (GA) facility located 2 miles NW of town, and scheduled airline flights are available at the Hyannis Municipal Airport in the neighboring town of Barnstable (State of Massachusetts 2007). The nearest international airports are Logan International in Boston (90 miles away) and T.F Green Airport in Warwick, RI (100 miles away) (MapQuest nd). There are three commercial piers located in Stage Harbor, all of which are privately owned.99

Chatham has two main commercial fishing docks: Chatham Fish Pier and the privately owned Stage Harbor fish pier100. Two berths at the town dock are always kept by the town and local vessels and businesses can compete for them every 5 years. One is currently used by Chatham Fish and Lobster, which won a renewal of its 5 year lease in 2007101.

H. INVOLVEMENT IN NORTHEAST FISHERIES102

Commercial

Cod had the highest landings in pounds within state waters for 2003. Shellfishing is also very important in Chatham. Approximately 150 people depend on the shell fishing in Chatham.103 Federal landed value data reveals that largemesh groundfish were the highest value catch between the years 1997 and 2006. There are a variety of landed groups in Chatham, with largemesh groundfish, "Other", and lobster yielding the highest values (Table 1). The number of vessels whose home port was Chatham stayed relatively consistent over the 1997-2006 time period, with a small spike in 2002 and a significant decline in 2006. Likewise, the level of fishing home port value stayed consistent during the same time. The number of vessels whose owner's city was Chatham fluctuated between 61 and 94 vessels, showing the same decline in 2006. The level of fishing landed port was also stable, with a spike in 2001 (Table 2).

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99 Profile review comment, Stuart Smith, Harbormaster, September 19, 2007

100 Pers. com. Lorraine Spenle, NMFS Port Agent, Chatham, November 5, 2008.

101 Pers. com. Dave Carnes, owner Chatham Fish and Lobster, November 5, 2008.

102 In reviewing the commercial landings data several factors need to be kept in mind. 1) While both federal and state landings are included, some states provide more detailed data to NMFS than others. For example, shellfish may not be included or data may be reported only by county and not by port. 2) Some communities did not have individual port codes until more recently. Before individual port codes were assigned, landings from those ports were coded at the county level or as an aggregate of two geographically close small ports. Where landings were coded at the county level they cannot be sorted to individual ports for those earlier years, e.g., prior to 2000. 3) Where aggregated codes were used, those aggregate codes may still exist and be in use alongside the new individual codes. Here the landings which are still assigned to the aggregate port code cannot be sorted into the individual ports, so port level data are only those which used the individual port code. 4) Even when individual port codes exist, especially for small ports, landings may be coded at the county level. Here again it is impossible to disaggregate these to a port level, making the port level landings incomplete. 5) In all these cases, the per port data in this profile may under report the total level of landings to the port, though all landings are accounted for in the overall NMFS database.

103 pers. com. Stuart Moore of the Coastal Resources (508) 945-5184, August 2004

Skate has been targeted by Chatham vessels since 2002 or 2003. About 10 vessels were the heart of this fleet, all gillnets. Half of them joined the Georges Bank Fixed Gear Sector when it began in 2006, in order to target more cod. These vessels still catch skate but less than previously. There are draggers (trawlers) which catch skate off of Chatham, as a bycatch, but these are primarily New Bedford based vessels. Chatham has little in the way of draggers104.

Only 9 towns have 50 or more skate permits which list them as homeport or owner's residence; Chatham is one. It accounts for 3.2% of skate homeports as listed on the permits, and 1.1% of owners' residences. In 2007 it was 2nd in total skate landings (3,101,339lbs) for the Northeast and 3rd in total skate value ($1,550,200). This was 33% of all skate value landed in the region and 89% of all landed value in Chatham, making Chatham both important to the skate fishery as a whole and strongly dependent on skate for the town's fishing revenue. Chatham had 6 skate dealers in 2007. Given that some of Chatham's skate is brought in for bait, a few of these may be vessels selling to local lobster pot fishermen, rather than storefront operations. Nantucket Fish buys from about 5 dayboat gillnetters who target monkfish and skate. AML International, based in New Bedford, also buys a lot of product in Chatham105. AML is one of the largest skate processors.

Landings by Species

Table 1 Rank Value of Landings for Federally Managed Groups

	Rank Value of Average Landings from 1997-2006
Largemesh Groundfish106	1
Other107	2
Lobster	3
Scallop	4
Monkfish	5
Dogfish	6
Skate	7
Squid, Mackerel, Butterfish	8
Summer Flounder, Scup, Black Sea Bass	9
Bluefish	10
Smallmesh Groundfish108	11
Surf Clams, Ocean Quahog	12
Tilefish	13
Herring	14

(Note: Only rank value is provided because value information is confidential in ports with fewer than three vessels or fewer than three dealers, or where one dealer predominates in a particular species and would therefore be identifiable.)

Vessels by Year109

104Pers.com. Eric Brazer of the CCCHFA, and 3 skate gillnetters, October 29, 2008.
105 Pers. com. Louis Juillard, owner of AML International, October 31, 2008.
106 Largemesh Groundfish: cod, winter flounder, yellowtail flounder, American plaice, sand-dab flounder, haddock, white hake, redfish, and pollock
107 "Other" species includes any species not accounted for in a federally managed group
108 Smallmesh Multi-Species: red hake, ocean pout, mixed hake, black whiting, silver hake (whiting)
109 Numbers of vessels by owner's city and homeport are as reported by the permit holder on permit application forms. These may not correspond to the port where a vessel lands or even spends the majority of its time when docked.

Table 2. Federal Vessel Permits Between 1997-2006

Year	# Vessels (home ported)	# Vessels (owner's city)
1997	146	87
1998	131	75
1999	130	77
2000	131	79
2001	135	81
2002	162	94
2003	161	94
2004	145	82
2005	136	72
2006	117	61

(Note: # Vessels home ported = No. of permitted vessels with location as homeport,
 # Vessels (owner's city) = No. of permitted vessels with location as owner residence110)

Recreational

There are at least 27 charter fishing businesses located in Chatham, five of which work from the Chatham Fish Pier.111 Due to restricted Days at Sea regulations, especially for groundfish, and to limits on striped bass (as of August 2004), some commercial fishermen use their fishing boats as day charters. This allows fishermen to still make money at sea even when they cannot catch and sell fish commercially. Thursday through Saturday fishermen cannot sell their catches, so catch and release fishing is practiced by the few that are combination commercial/recreational charter fishermen.112

Subsistence

Information on subsistence fishing in Chatham is either unavailable through secondary data collection or the practice does not exist.

i. FUTURE

During a field visit to Chatham by the NEFSC Social Science Branch community profilers (August 2004), the CCCHFA mentioned that intense pressure exists on the coastal fishing infrastructure due to gentrification and increasing costs. In Stage Harbor, there are three commercial piers which are privately owned; two by families and the third by the Stage Harbor Yacht Club. While all are presently used for commercial off-loading, any of these piers could easily be converted to a use inconsistent with the needs of the commercial fishing industry in Chatham.113

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110 The Owner-City from the permit files is technically the address at which the owner receives mail concerning their permitted vessels, which could reflect the actual location of residence, the mailing address as distinct from residence, owner business location, or the address at which a subsidiary receives mail about the permits.

111 Profile review comment, Stuart Smith, Harbormaster, September 19, 2007

112 pers. com. Captain Mike during field visit to Chatham, August 4, 2004 with JE, PS, and LS.

113 Profile review comment, Stuart Smith, Harbormaster, September 19, 2007

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f. NEW BEDFORD, MA[114]

Community Profile[115]

J. PEOPLE AND PLACES

i.Regional orientation

New Bedford is the fourth largest city in the commonwealth of Massachusetts. It is situated on Buzzards Bay, located in the southeastern section of the state in Bristol County. New Bedford is bordered by Dartmouth on the west, Freetown on the north, Fairhaven and Acushnet on the east, and Buzzards Bay on the south. The city is 54 miles south of Boston (State of Massachusetts 2006), and has a total area of 24 mi^2, of which about 4 mi^2 (16.2%) is water (USGS 2008).

Map 13. Location of New Bedford, MA (US Census Bureau 2000a)

ii.Historical/Background

New Bedford, originally part of Dartmouth, was settled by Plymouth colonists in 1652. Fishermen established a community in 1760 and developed it into a small whaling port and shipbuilding center within five years. By the early 1800s, New Bedford had become one of the world's leading whaling ports. Over one half of the U.S. whaling fleet, which totaled more than 700 vessels, was registered in New Bedford by the mid 1800s. However, the discovery of petroleum greatly decreased the demand for sperm oil, bringing economic devastation to New Bedford and all other whaling ports in New England. The last whale ship sailed out of New Bedford in 1925 (New Bedford Whaling Museum 2006). In attempts to diversify its economy, the town manufactured textiles until the southeast cotton boom in the 1920s. Since then, New Bedford has continued to diversify, but the city is still a

114 These community profiles have been created to serve as port descriptions in Environmental Impact Statements (EISs) for fisheries management actions. They also provide baseline information from which to begin research for Social Impact Assessments (SIAs). Further, they provide information relevant to general community impacts for National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and information on minorities and low income populations for Executive Order (E.O.) 12898 on Environmental Justice.
115 For purposes of citation please use the following template: "Community Profile of *Town, ST*. Prepared under the auspices of the National Marine Fisheries Service, Northeast Fisheries Science Center. For further information contact Lisa.L.Colburn@noaa.gov."

major commercial fishing port (USGenNet 2006). It consistently ranks in the top two ports in the U.S. for landed value.

iii.Demographics *116*

According to Census 2000 data (US Census Bureau 2000a), New Bedford had a total population of 93,768, down 6.2% from a reported population of 99,922 in 1990 (US Census Bureau 1990). Of this 2000 total, 47.1% were males and 52.9% were females. The median age was 35.9 years and 71.2 % of the population was 21 years or older while 18.9% was 62 or older.

New Bedford's age structure (see Figure 1) by sex shows a higher number of females in each age group between 20 and over 80 years. There is no drop in the 20-29 age group (as occurs in many smaller fishing communities), which could be due to New Bedford's proximity to Boston (several universities), the local sailing school, the Northeast Maritime Institute, or a large number of employment opportunities.

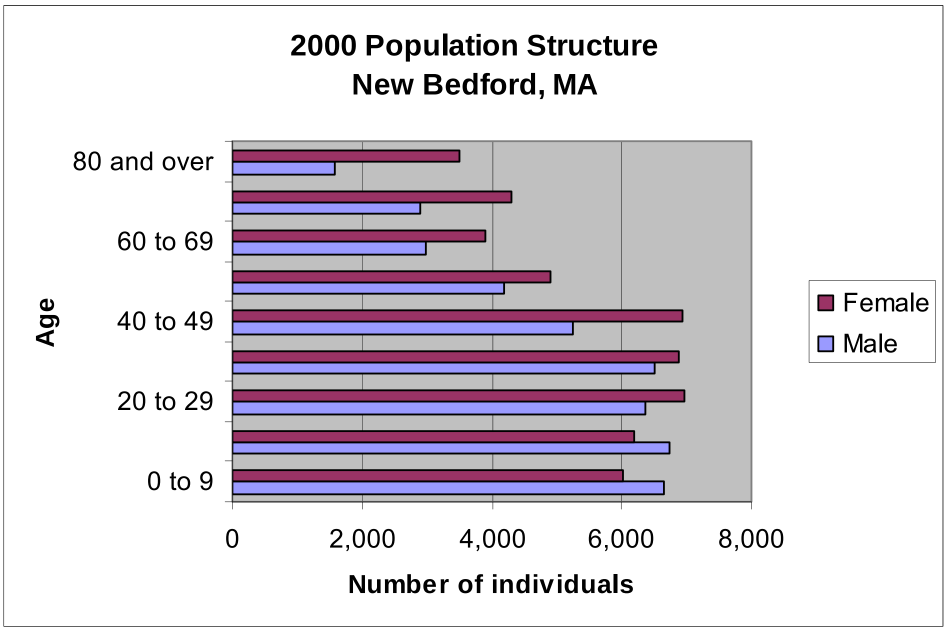

Figure 1. New Bedford's population structure by sex in 2000 (US Census Bureau 2000a)

The majority of the population was white (83.8%), with 4.7% of residents black or African American, 0.7% Asian, 0.6% Native American, and 0.05% Pacific Islander or Hawaiian (see Figure 2). Only 10.2% of the population identified themselves as Hispanic/Latino (see Figure 3). (One community member noted that this number is probably much higher, but many undocumented immigrants do not respond to the Census. He noted that many Hispanics/Latinos work on fishing vessels and in processing plants.)117 Residents linked their backgrounds to a number of different ancestries including: Portuguese (38.6%), French (9.1%), and Sub-Saharan African (8.2%) (the vast majority of which are Cape Verdean) . With regard to region of birth, 67.8% were born in Massachusetts, 8.0% were born in a different state, and 19.6% were born outside of the U.S. (including 9.2% who were not United States citizens).

116 While mid-term estimates are available for some larger communities, data from the 2000 Census are the only data universally available for the communities being profiled in the Northeast. Thus for cross-comparability we have used 2000 data even though these data may have changed significantly since 2000 for at least some communities.
117 Profile review comment, Rodney Avila, former commercial fisherman, August 14, 2007

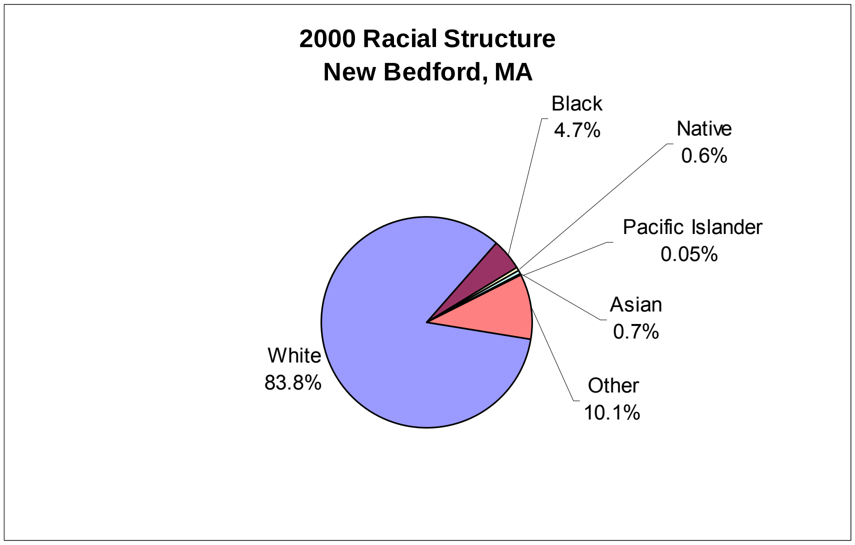

Figure 2. Racial Structure in 2000 (US Census Bureau 2000a)

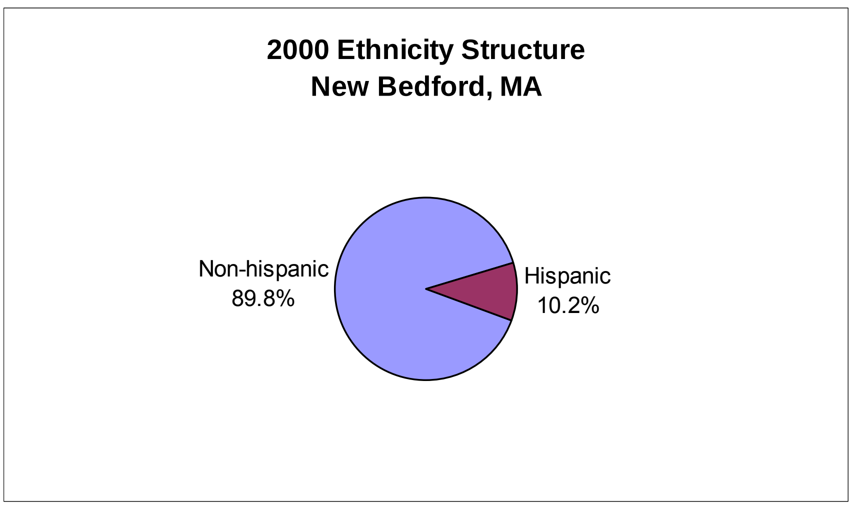

Figure 3. Ethnic structure in 2000 (US Census Bureau 2000a)

For 62.2% of the population, only English was spoken in the home, leaving 37.8% in homes where a language other than English was spoken, including 17.3% of the population who spoke English less than “very well” according to the 2000 Census.

Of the population 25 years and over, 57.6% were high school graduates or higher and 10.7% had a bachelor’s degree or higher. Again of the population 25 years and over, 24.3% did not reach ninth grade, 18.1% attended some high school but did not graduate, 27.7% completed high school, 13.9% had some college with no degree, 5.3% received an associate’s degree, 7.5% earned a bachelor’s degree, and 3.2% received either a graduate or professional degree.

Although religion percentages are not available through U.S. Census data, according to the Association of Religion Data Archives (ARDA) in 2000, the religion with the highest number of congregations and adherents in the Bristol County was Catholic with 85 congregations and 268,434 adherents. Other prominent congregations in the county were United Methodist (17 with 3,583 adherents), United Church of Christ (19 with 5,728 adherents) and Episcopal (18 with 5,100 adherents). The total number of adherents to any religion was up 9.4% from 1990 (ARDA 2000).

iv.Issues/Processes

New Bedford struggles with highly contaminated harbor water and harbor sediment. New Bedford Harbor is contaminated with metals and organic compounds, including polychlorinated biphenyls (PCBs) (US Department of Commerce 2002). Because of the high concentrations of PCBs in the sediment, New Bedford Harbor was listed by the U.S. EPA as a Superfund site in 1982 and cleanup is underway. Significant levels of these pollutants have accumulated in sediments, water, fish, lobsters, and shellfish in the Harbor and adjacent areas. New Bedford is also the only major municipality in the Buzzards Bay area to discharge significant amounts of untreated combined sewage, industrial waste, and storm water from combined sewer overflows (BBNEP 1991).

The pollution problem not only affects human health and the ecosystem, but has a large impact on New Bedford's economy. For example, closures of fishing areas in the harbor have caused economic losses in the millions for the quahog landings alone. Closure of the lobster fishery resulted in an estimated loss of $250,000 per year and the finfish industry and recreational fishing have also been negatively affected (Comprehensive Conservation and Management Plan 1991). In addition to contaminated harbor sediments, numerous brownfield properties are located in proximity to the port, especially on the New Bedford side (US Department of Commerce 2002).

Another issue in New Bedford is sufficient fishing crew members. According to a 2002 newspaper article, fishing vessel owners complain of a shortage of crewmen. They attribute this scarcity to low unemployment rates that have kept laborers from the docks. Many choose to bypass work that government statistics place among the most dangerous jobs in the country. Many crewmembers are either inexperienced or come from foreign countries. Both present safety issues, according to one fisherman, because inexperienced crew get hurt more often and foreign crew have significant language barriers that impede communication. Additionally, the article noted, those willing to work sometimes struggle with alcohol and drug dependency. Ship captains have applicants roll up their shirt sleeves to check for traces of heroin use (Paul NC, Scripter C 2002). However, a community member and former fisherman commented that this is not normal procedure; most of the drug problems in the city come from crew members on out-of-town boats. He also noted that with a decrease in days at sea vessels are allowed to fish, crew members have been more steady, most working on more than one vessel owned by a single owner.118

New Bedford is the largest skate port in the Northeast. As both a food and bait skate port it will be heavily impacted by any new skate regulations.

v.Cultural attributes

In September 2007, New Bedford hosted the fourth annual Working Waterfront Festival, dedicated to the commercial fishing industry in New Bedford. This festival is a chance for the commercial fishing industry to educate the public about its role in the community and in providing seafood to consumers, through boat tours, demonstrations, and contests. The annual Blessing of the Fleet is held as part of the Working Waterfront Festivalhttp://www.workingwaterfrontfestival.org/.

The New Bedford community celebrates its maritime history with a culmination of activities in the New Bedford Summerfest. The Summerfest is held annually in July in conjunction with the New Bedford State Pier and the New Bedford National Whaling Historical Park. Summerfest also includes the Cape Verdean Recognition Day Parade and the Cape Verdean American Family Festivalhttp://www.newbedfordsummerfest.com/.

The community has taken an active role in the remembrance of its maritime heritage. The Azorean Maritime Heritage Society, the New Bedford Whaling Museum and the New Bedford Whaling National Historical Park have cooperated to raise awareness of the maritime history of the Azorean community on both sides of the Atlantic.

The New Bedford Whaling Museum was established by the Old Dartmouth Historical Society in 1907 to tell the story of American whaling and to describe the role that New Bedford played as the whaling capital of the world in the nineteenth century. Today the whaling Museum is the largest museum in America devoted to the history of the American whaling industry and its greatest port.

The New Bedford Whaling National Historical Park was created in 1996 and focuses in the city's whaling history. The park covers 13 city blocks and includes a visitor center, the New Bedford Whaling Museum, and the Rotch-Jones-Duff House and Garden Museum (US Department of the Interior 2006).

118 Profile review comment, Rodney Avila, former commercial fisherman, August 14, 2007

Every summer, the City of New Bedford offers a free monthly cultural night in downtown called “Aha!” (Art, History & Architecture). Started in 1999, the series includes music, open galleries, vendors, and music on the second Thursday of each month.

K. INFRASTRUCTURE

i.Current Economy

The New Bedford Economic Development Council (NBEDC), Inc. was established in 1998 to improve the city’s economic development by helping to attract business and job opportunities to the city. The NBEDC also provides small business funds and offers financial support (in loans) for new businesses or those who want to expand. One of their loan funds is specifically targeted at fishermen (NBEDC 2006).

With a federal grant and local funds, the city and the Harbor Development Council (HDC) in 2005 began construction on a $1 million, 8,500-square foot passenger terminal at State Pier to support passenger ferry service. The HDC received a federal grant for more than $700,000 to construct the passenger terminal and to improve berthing at the New Bedford Ferry Terminal (NBEDC 2006). The city has also redeveloped Standard Times Field, a brownfield site, into an industrial park targeted towards the seafood industry; a number of seafood processors have relocated to this site.119

According to a 1993 survey, major employers that provided over 100 jobs in New Bedford included the following businesses with the number of employees in parentheses: Acushnet Company (1,600), Cliftex (1,400 – now out of business120), Aerovox (800), Calish Clothing (750), and Polaroid (465) (City of New Bedford 2006). “According to a study conducted in July 1998, harbor-related businesses account for an estimated $671 million in sales and 3,700 jobs within the local area. The core seafood industry, comprising harvesting vessels and dealers/processors, contributes nearly $609 million in sales and 2,600 local jobs (State of Massachusetts 2002).” New Bedford accounts for 45% of employment in the seafood harvesting sector in the state of Massachusetts (State of Massachusetts 2002).

According to the U.S. Census 2000121, 57.7% (42,308 individuals) of the total population 16 years of age and over were in the labor force (see Figure 4), of which 5.0% were unemployed, 0.2% were in the Armed Forces, and 52.5% were employed.

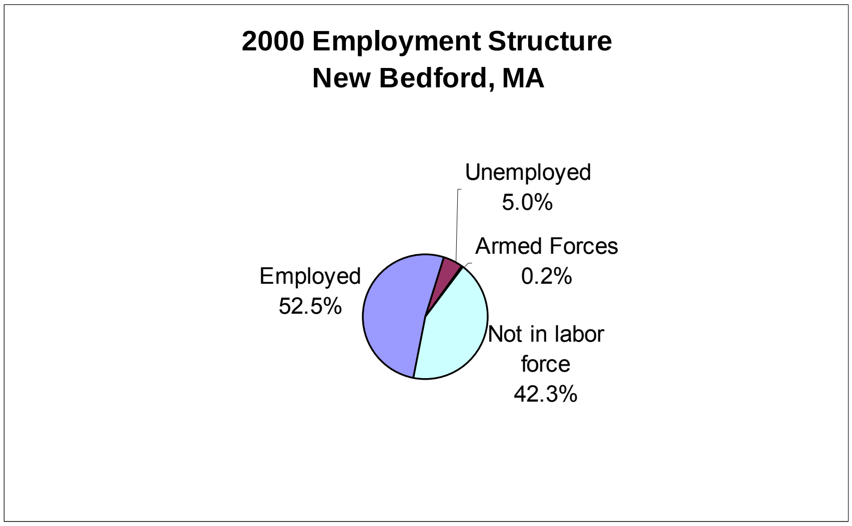

Figure 4. Employment structure in 2000 (US Census Bureau 2000a)

119 Profile review comment, Dave Janik, Massachusetts Department of Coastal Zone Management, October 5, 2007
120 Profile review comment, Rodney Avila, former commercial fisherman, August 14, 2007
121 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

According to Census 2000 data, jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 407 or 1.1% of all jobs. Self employed workers, a category where fishermen might be found, accounted for 1,485 or 3.9% of the labor force. Educational, health and social services (20.9%), manufacturing (20.7%), retail trade (12.1%), entertainment, recreation, accommodation and food services (7.4%), and construction (7.1%) were the primary industries.

Median household income in New Bedford was $27,569 (up 21.7% from $22,647 in 1990 (US Census Bureau 1990a)) and median per capita income was $15,602. For full-time year round workers, males made approximately 29.0% more per year than females.

The average family in New Bedford consisted of 3.01 persons. With respect to poverty, 17.3% of families (up from 16.8% in 1990 (US Census Bureau 1990a)) and 20.2% of individuals earned below the official U.S. Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families, depending on number of persons (2-9) (US Census Bureau 2000b). In 2000, 48.8% of all families (of any size) earned less than $35,000 per year.

In 2000, New Bedford had a total of 41,511 housing units of which 92.0% were occupied and 30.2% were detached one unit homes. Approximately half (49.9%) of these homes were built before 1940. Mobile homes in this area accounted for 0.3% of the total housing units; 95.0% of detached units had between 2 and 9 rooms. In 2000, the median cost for a home in this area was $113,500. Of vacant housing units, 0.3% were used for seasonal, recreational, or occasional use. Of occupied units 56.2% were renter occupied.

ii.Government

New Bedford was incorporated as a town in 1787 and as a city in 1847. The city of New Bedford has a Mayor and a City Council (City of New Bedford 2006).

iii.Fishery involvement in government

The Harbor Development Commission includes representatives from the fish-processing and harvest sectors of the industry. NOAA Fisheries, Fisheries Statistics Office, has two port agents based in New Bedford. Port agents sample fish landings and provide a ‘finger-on-the-pulse’ of their respective fishing communities. “The HDC has jurisdiction over all the waters in New Bedford, including the entire coastline of the peninsula, the harbor, and north along the Acushnet River to the city’s boundaries. The HDC manages city property on the waterfront, including Homer’s, Leonard’s, Steamship, Coal Pocket and Fisherman’s Wharves and a 198-slip recreational marina at Pope’s Island. The HDC also assigns moorings and enforces rules regarding use of piers, wharves, and adjacent parking areas under its jurisdiction. The Harbormaster acts as an agent of the HDC (City of New Bedford 2006).” New Bedford also has a Shellfish Warden.

iv.Institutional

v.Fishing associations

There are a variety of fishing associations which aid the fishing industry in New Bedford, including the American Dogfish Association, the American Scallop Association, and the Commercial Anglers Association. New Bedford also is home to a Fishermen’s Wives Association which began in the early 1960s. Additionally, New Bedford has the Offshore Mariner’s Wives Association which includes a handful of participants that organize the “Blessing of the Fleet” (Hall-Arber et al. 2001).

The Massachusetts Fisherman’s Partnership focuses on issues for fishermen in different ports in Massachusetts. The Partnership responded to the need of health care for fishermen and their families by developing the Fishing Partnership Health Insurance Plan with federal and state aid. This plan has been in place since 1997 and reduces the amount of money that fishermen’s families have to pay to be covered by health insurance (Hall-Arber et al. 2001).

vi.Fishing assistance centers

Shore Support has been the primary fishing assistance center in New Bedford since 2000 (Hall-Arber et al. 2001). Their mission is “to identify and organize the rank and file fishermen in the port of New Bedford, to keep fishing families aware of retraining opportunities and human services when necessary, and to create a liaison between the rank and file fishermen and the regulatory system.” The New Bedford Fishermen and Families Assistance Center, formerly active here, has closed its doors, and the Trawlers Survival Fund is no longer active. The Industry Survival Fund, which deals with the scallop industry, is active in New Bedford at present.122

vii. Other fishing related organizations

There are several other fishing related organizations and associations that are vital to the fishing industry such as the Fisheries' Survival Fund (Fairhaven), the New Bedford Fishermen's Union, the New Bedford Seafood Coalition, and the New Bedford Seafood Council (Hall-Arber 2001).

The Community Economic Development Center is a non-profit organization vested in the economic development of the local community. The organization is unique in that it is involved with fisheries management. The center is currently engaged in a research project to better understand the employment status in the fishing industry. The center is a liaison for migrant workers and other newcomers to the community to have access to the benefits provided by the city. In the past the center at one time had a re-training program for displaced fishermen to move into aquaculture.

The School for Marine Science and Technology (SMAST), part of the University of Massachusetts at Dartmouth, is based in New Bedford. SMAST is a graduate school offering interdisciplinary degrees in ocean and marine science, including fisheries science and management.

viii. Physical

Interstate 195 and State routes 24 and 140 provide access to the airports, ports, and facilities of Providence and Boston. In addition to being only about 50 miles from Boston, New Bedford is located 33 miles southeast of Providence, RI and approximately 208 miles from New York City. “New Bedford Harbor is at the mouth of the Acushnet River, which flows south into Buzzards Bay and the Atlantic Ocean. The entrance to the harbor is nine nautical miles from the beginning of the Cape Cod Canal shipping channel. The Port of New Bedford is a deep-water port with depths of 30 feet. The harbor features a hurricane barrier that stretches across the water from the south end of New Bedford to the Town of Fairhaven. The barrier's 150-foot opening is closed during hurricane conditions and coastal storms. As a result, the harbor is one of the safest havens on the eastern seaboard (City of New Bedford 2006).”

The Consolidated Rail Corporation (Conrail) provides services into New Bedford. The New Bedford Municipal Airport is located 2 miles NW of the city. Cape Air, located in Hyannis on Cape Cod, offers flights to and from New Bedford, as does Bayside Air Charter (located at the New Bedford Regional Airport). Ferry service to the island of Martha's Vineyard is available daily (year-round) from the State Pier in the city. Whaling City Harbor Tours & Water Taxi Service offers mooring-to-dock services in the summer months to recreational boaters. They also offer tours of the commercial fishing fleet and the lighthouse, also in the summer season. Intercity bus service is offered by American Eagle Motor Coach, Inc. and Bonanza Bus Lines to Cape Cod, Providence, Newport, and Boston. Southeastern Regional Transit Authority offers local bus service throughout the New Bedford area. The Massachusetts Bay Transportation Authority has been considering extending the commuter rail service to New Bedford from Boston. In the summer of 2007, a pilot fast ferry service started between New Bedford and Woods Hole; the service ran for four months, and will be evaluated by city officials to determine whether it will continue (Urbon 2007).

There are several marinas in New Bedford and nearby Fairhaven, in addition to the major commercial docks. The HDC operates the 198-slip public marina at Pope's Island, which is located within the Hurricane Barrier in the upper harbor east of the New Bedford/Fairhaven Bridge. Pope's Island Marina is situated along the south side of the island and receives financial assistance from the Massachusetts Department of Conservation and Recreation. Services include on-site laundry facilities, pump out facilities, shower rooms, and conference room, with dockside water and electricity available http://www.ci.new bedford.ma.us/PortofNewBedford/GettingAround/PopesIsland.html. There are more than 950 recreational boat slips in New Bedford/Fairhaven Harbor (City of New Bedford 2006).

122 Profile review comment, Rodney Avila, former commercial fisherman, August 14, 2007

L. INVOLVEMENT IN NORTHEAST FISHERIES123

i.Commercial

In the 1980s, fishermen experienced high landings and bought new boats due to a booming fishing industry. In the 1990s, however, due to exhausted fish stocks, the fishing industry experienced a dramatic decrease in groundfish catches and a subsequent vessel buyback program, and strict federal regulations in attempts to rebuild the depleted fish stocks. A new decade brought more changes for the fishing industry (Kennedy 2001). By 2000 and 2001 New Bedford was the highest value port in the U.S. (generating $150.5 million in dockside revenue) (Plante 2002).

The range of species landed in New Bedford is quite diverse and can be separated by State and Federal (see Table 1) permits, however this profile displays only Federal landings data. It is important to note that according to State permits, the largest landings were of cod, haddock, and lobster, and with impressive representation by a number of different species. According to the federal commercial landings data, New Bedford's most successful fishery in the past ten years has been scallops, followed by groundfish. Scallops were worth significantly more in 2006 than the 1997-2006 average values, and the total value of landings for New Bedford generally increased over the same time period. The value of groundfish in 2006, however, was considerably less than the ten-year average value. The number of vessels whose home port was New Bedford increased somewhat between 1997 and 2006, while the value of fishing for home port vessels more than doubled from $80 million to $184 million over the same time period. The number of vessels whose owner's city was New Bedford fluctuated between 137 and 199 vessels, while the value of landings in New Bedford tripled from $94 million in 1998 to and $281 million in 2006 (see Table 2). One community member notes that the number of vessels in the harbor as of 2007 is up to 232. The number of fishing vessels based out of New Bedford has increased in the last few years due a loss of infrastructure in other ports; New Bedford has seen vessels relocate here from Gloucester, Portland, Plymouth, Newport, and even as far away as Virginia.124

With respect to skate, New Bedford has the largest number of 2007 skate permits of any town/port as measured both by reported homeport (9.7% of all skate permits) and owner's town of residence (7.7% of all skate permits). New Bedford also has the highest level of 2007 skate landings (10,179,163lbs) and revenues ($4,869,521) of any port. This includes important levels of both food skate (wings) and bait skate. Most New Bedford skate comes in on trawlers, but there are also a few gillnet vessels125. Some of the New Bedford fleet fishes off of Chatham in the winter126. The trawlers often prefer the Northern Edge127.

New Bedford has approximately 44 fish wholesale companies, 75 seafood processors, and some 200 shore side industries (Hall-Arber 2001). Maritime International has one of the largest U.S. Department of Agriculture-approved cold treatment centers on the East Coast. Its terminal receives approximately 25 vessels a year, most carrying about 1,000 tons of fish each. American Seafoods, one of the largest seafood companies in the United States, has a large processing facility in New Bedford where they process primarily scallops. Norpel (Northern

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123 In reviewing the commercial landings data several factors need to be kept in mind. 1) While both federal and state landings are included, some states provide more detailed data to NMFS than others. For example, shellfish may not be included or data may be reported only by county and not by port. 2) Some communities did not have individual port codes until more recently. Before individual port codes were assigned, landings from those ports were coded at the county level or as an aggregate of two geographically close small ports. Where landings were coded at the county level they cannot be sorted to individual ports for those earlier years, e.g., prior to 2000. 3) Where aggregated codes were used, those aggregate codes may still exist and be in use alongside the new individual codes. Here the landings which are still assigned to the aggregate port code cannot be sorted into the individual ports, so port level data are only those which used the individual port code. 4) Even when individual port codes exist, especially for small ports, landings may be coded at the county level. Here again it is impossible to disaggregate these to a port level, making the port level landings incomplete. 5) In all these cases, the per port data in this profile may under report the total level of landings to the port, though all landings are accounted for in the overall NMFS database.

124 Profile review comment, Rodney Avila, former commercial fisherman, August 14, 2007

125 Pers.com. Bill McCann, New Bedford gillnetter, November 2,2008; pers.com. Tim Linnel, Chatham gillnetter, October 29, 2008.

126 Pers. com. Matt Linnell, Chatham gillnetter, October 29, 2008.

127 Pers.com. Jim Nash, Chatham gillnetter, October 29, 2008.

Pelagic Group, LLC), also in New Bedford, is one of the largest pelagic processing companies in the United States, catching and processing both mackerel and herring with a dedicated fleet of mid-water trawlers. New Bedford's auction house, Whaling City Seafood Display Auction, opened in 1994, allowing fishermen to get fair prices for their catch and providing buyers with a more predictable supply of seafood. One of the recommendations of the New Bedford/Fairhaven Harbor Plan was to establish effective public oversight of the auction process (State of Massachusetts 2002).

New Bedford has 12 skate dealers in 2007, including the Whaling City Seafood Display Auction, Carlos Seafood (also owns 28 vessels)128, ANE Seafood (which also owns 2 vessels and buys from 10), Nebula Foods, Inc. and Northern Wind, Inc. There are several processors which buy part of their product direct from vessels such as Bergies Seafood (about 37 employees)129, SeaFresh USA (which buys from about 20 vessels in New Bedford but is not based here)130, AML International (about 90 employees and buy from 60 vessels plus offloaders and the Auction)131, An additional skate processor based here but which buy from offloaders and the auction rather than direct from vessels is Sea Trade (about 75 local employees)132.

Landings by Species

Table 1. Dollar value of Federally Managed Groups of landings in New Bedford

	Average from 1997-2006	2006 only
Scallop	108,387,505	216,937,686
Largemesh Groundfish133	30,921,996	23,978,055
Monkfish	10,202,039	8,180,015
Surf Clams, Ocean Quahog	7,990,366	9,855,093
Lobster	4,682,873	5,872,100
Other134	4,200,323	2,270,579
Skate	2,054,062	3,554,808
Squid, Mackerel, Butterfish	1,916,647	5,084,463
Summer Flounder, Scup, Black Sea Bass	1,481,161	2,227,973
Smallmesh Groundfish135	897,392	1,302,488
Herring	767,283	2,037,784
Dogfish	89,071	13,607
Bluefish	25,828	10,751
Tilefish	2,675	1,084

128 Pers. com. Carlos Rafael, owner Carlos Seafood, October 28, 2008.
129 Pers. com. Phil Mellow, Bergies seafood, October 21, 2008.
130 Pers. com. Larry Lindgren, Sea Fresh USa, October 24, 2008.
131 Pers. com. Louis Juillard, owner AML International, October 31, 2008.
132 Pers. com. Walter Barrett, Sea Trade, October 24, 2008.
133 Largemesh Groundfish: cod, winter flounder, witch flounder, yellowtail flounder, am. plaice, sand-dab flounder, haddock, white hake, redfish, and pollock
134 "Other" species includes any species not accounted for in a federally managed group
135 Smallmesh Multi-Species: red hake, ocean pout, mixed hake, black whiting, silver hake (whiting)

ii.Note: Red crab are also landed, but data cannot be reported due to confidentiality.

Vessels by Year136

Table 2: All columns represent vessel permits or landings value combined between 1997-2006

Year	# Vessels (home ported)	# Vessels (owner's city)	Level of fishing home port ($)	Level of fishing landed port ($)
1997	244	162	80,472,279	103,723,261
1998	213	137	74,686,581	94,880,103
1999	204	140	89,092,544	129,880,525
2000	211	148	101,633,975	148,806,074
2001	226	153	111,508,249	151,382,187
2002	237	164	120,426,514	168,612,006
2003	245	181	129,670,762	176,200,566
2004	257	185	159,815,443	206,273,974
2005	271	195	200,399,633	282,510,202
2006	273	199	184,415,796	281,326,486

(Note: # Vessels home ported = No. of permitted vessels with location as homeport
 # Vessels (owner's city) = No. of permitted vessels with location as owner residence137
Level of fishing home port ($) = Landed value of fisheries associated with home ported vessels
Level of fishing landed port ($) = Landed value of fisheries landed in location)

iii.Recreational

While recreational fishing in New Bedford Harbor is discouraged due to heavy metal contamination (Department of Health and Human Services), a number of companies in New Bedford offer the public recreational fishing excursions including boat charters. There are also several bait and tackle stores, many of which serve as official state fishing derby weigh-in stations. "In 1999 there were approximately 950 slips in New Bedford Harbor and 85% were visitor based. According to FXM Associates, marina operators agreed that an additional 200 slips could be filled. A few owners of fishing boats in the 45 to 50 foot range have obtained licenses for summer party boat fishing. Tuna is a popular object for recreational fishing as are stripped bass" (Hall-Arber et al. 2001).

iv.Subsistence

While no information on subsistence fishing in New Bedford was obtained through secondary data collection, the large number of ethnic groups in New Bedford may indicate subsistence fishing does occur.

m. FUTURE

For several years, work was underway to construct the New Bedford Oceanarium that would include exhibits on New Bedford's history as a whaling and fishing port, and was expected to revitalize the city's tourist industry and create jobs for the area. The Oceanarium project failed to receive its necessary funding in 2003 and

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136 Numbers of vessels by owner's city and homeport are as reported by the permit holder on permit application forms. These may not correspond to the port where a vessel lands or even spends the majority of its time when docked.

137 The Owner-City from the permit files is technically the address at which the owner receives mail concerning their permitted vessels, which could reflect the actual location of residence, the mailing address as distinct from residence, owner business location, or the address at which a subsidiary receives mail about the permits.

2004, and while the project has not been abandoned, it seems unlikely the Oceanarium will be built anytime in the near future.

According to a 2002 newspaper article, many fishermen believe that based on the quantity and ages of the species they catch, the fish are coming back faster than studies indicate. While most admit that regulations have worked, they believe further restrictions are unnecessary and could effectively wipe out the industry. "If they push these [regulations] too hard, the whole infrastructure of fishing here could collapse," according to a New Bedford fishermen (Paul, Scripter 2002).

New Bedford has a Harbor Plan for New Bedford/Fairhaven harbor, which is focused on developing traditional harbor industries, capturing new opportunities for tourism and recreational use, rebuilding harbor infrastructure, and enhancing the harbor environment. Projects completed or underway as part of the Harbor Plan include a revitalization of the State Pier and redevelopment of the Standard Times Field as an industrial park to house fishing-related businesses (State of Massachusetts 2002). The plan received state approval in 2002, and was recognized as one of the most progressive harbor plans produced in the state.138

The Massachusetts Fisheries Institute is planned for New Bedford; the institute is collaboration between the University of Massachusetts, the Massachusetts Intercampus Graduate School of Marine Sciences and Technology, the Department of Marine Fisheries, and the Executive Office of Environmental Affairs. The project intends to team up scientists, fishermen, and graduate and undergraduate students to develop practical and innovative fisheries management applications.

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138 Profile review comment, Dave Janik, Massachusetts Department of Coastal Zone Management, October 5, 2007

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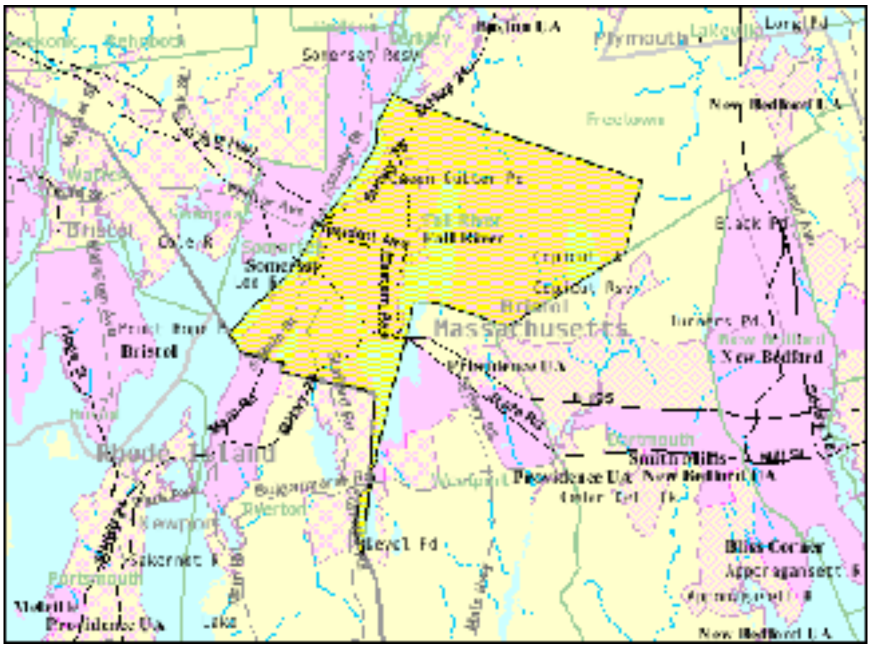
g. FALL RIVER, MA[139]

Community Profile[140]

People and Places

Regional orientation

The city of Fall River (41.70º N, 71.56º W) is located in Southeastern Massachusetts in Bristol County, along the Rhode Island border. It borders Westport, RI and is about 15 miles from New Bedford, MA. Fall River is 34 square miles in area (City of Fall River 2007) and sits on Mount Hope Bay at the mouth of the Taunton River (City of Fall River 2007). Mount Hope Bay is a component of the larger Narragansett Bay (USGS 2008).



Map 1. Location of Fall River, MA (US Census Bureau 2000)

Historical/Background

Fall River was home to the Wampanoag tribe until they were pushed out during King Phillip's War in 1675. The name comes from a translation of Quequechan, meaning "falling waters", the Wampanoag name for the area. The original settlers to the area were farmers and ships' carpenters from Rhode Island. It was founded in 1803, and incorporated as a city in 1854 (City of Fall River 2007). Fall River has a long industrial history; the first cotton mill was built here in 1811. This started a trend in textiles manufacturing that would eventually make Fall River one of the textile capitals of the nation. By the early 20th century it was known as Spindle City and had over 100 mills employing over 30,000 people. The abundance of mills drew English, Irish, Russian, Lebanese, French,

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139 These community profiles have been created to serve as port descriptions in Environmental Impact Statements (EISs) for fisheries management actions. They also provide baseline information from which to begin research for Social Impact Assessments (SIAs). Further, they provide information relevant to general community impacts for National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and information on minorities and low income populations for Executive Order (E.O.) 12898 on Environmental Justice.

140 For purposes of citation please use the following template: "Community Profile of *Town, ST*. Prepared under the auspices of the National Marine Fisheries Service, Northeast Fisheries Science Center. For further information contact Lisa.L.Colburn@noaa.gov."

Polish, Eastern European, and Jewish immigrants to Fall River, giving it the highest percentage of foreign-born residents in the U.S. by 1900. The largest percentage of migrants came from Portugal and the Azores. Fall River is also well known for being the home of Lizzie Borden, who according to lore killed her parents with an axe in the late 1800s, a story which captivated the nation. During the Depression, there was a significant economic downturn as jobs moved to the south and many mills closed; this economic decline continued through much of the 20th century and is only recently reversing itself. Today Fall River continues to have a highly ethnically diverse population (FRACCI 2007).

*Demographics**141***

According to Census 2000 data, Fall River had a total population of 91,938, (down 0.08% from the reported population of 92,703 in 1990 [US Census Bureau 1990]). Of this total in 2000, 53.3% were female and 46.7% were male. The median age was 35.7 years and 72.2% of the population was 21 years or older while 19.1% was 62 or older.

The population structure of Fall River (see Figure 1) the most populous age group in Fall River was 30-39, followed by closely 20-29 and 40-49. Women outnumbered men in all age groups beginning with age 20. Fall River does not experience the decline in population for the age group 20-29 experienced by many fishing communities, presumably because there are many employment opportunities for young people in this urban area.

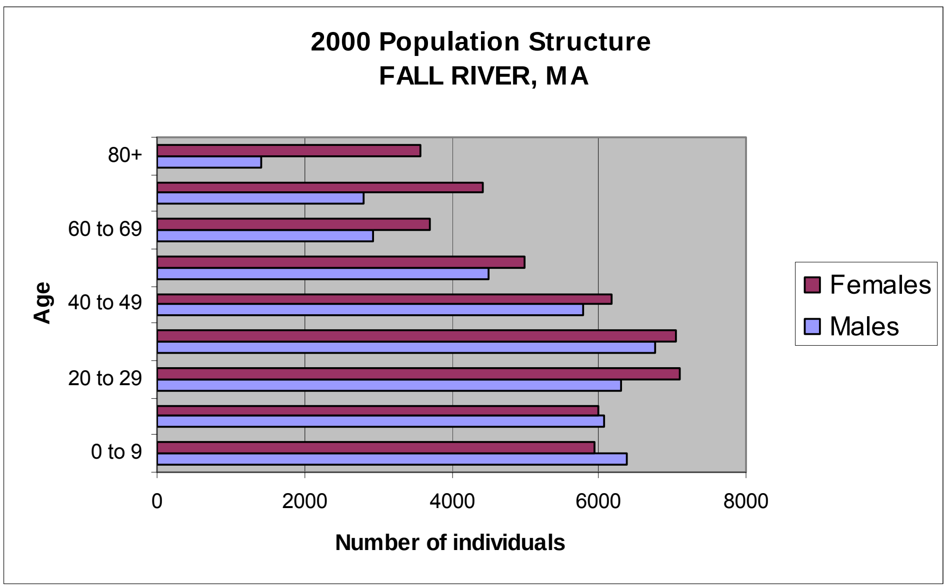

Figure 46. Fall River's population structure by sex in 2000

The majority of the population was white (90.9%), with 3.1% of residents black or African American, 0.6% Native American, 2.4% Asian, and 0.3% Pacific Islander or Hawaiian (see Figure 2). Only 3.3% of the total population identified themselves as Hispanic/Latino (see Figure 3). Residents linked their backgrounds to a number of different ancestries including: Portuguese (47.0%), French (13.4%), Irish (9.8%), English (6.6%), French Canadian (5.9%), and "other ancestries" (9.0%). Fall River is home to one of the largest populations of Azorean Portuguese in the United States (City of Fall River 2007). With regard to region of birth, 69.7% were born in Massachusetts, 9.2% were born in a different state and 19.8% were born outside of the U.S. (including 9.2% who were not United States citizens).

141 While mid-term estimates are available for some larger communities, data from the 2000 Census are the only data universally available for the communities being profiled in the Northeast. Thus for cross-comparability we have used 2000 data even though these data may have changed significantly since 2000 for at least some communities.

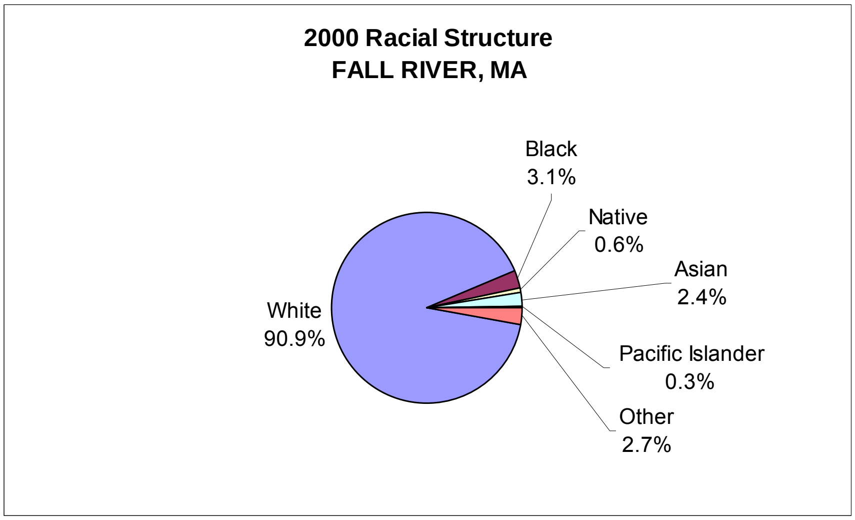

Figure 2. Racial Structure in 2000 (US Census Bureau 2000)

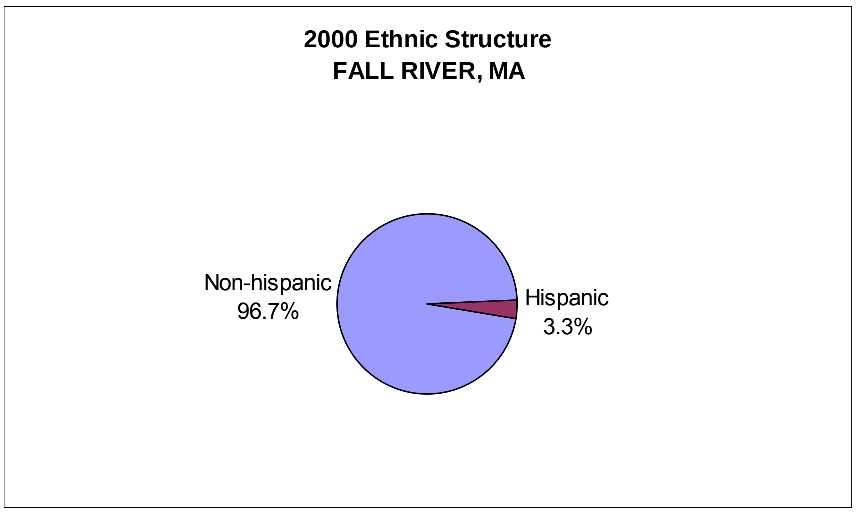

Figure 3. Ethnic Structure in 2000 (US Census Bureau 2000)

For 65.4% of the population, only English was spoken in the home, leaving 34.6% in homes where a language other than English was spoken, and including 15.0% of the population who spoke English less than 'very well' according to the 2000 Census.

Of the population 25 years and over, 56.6% were high school graduates or higher and 10.7% had a Bachelor’s degree or higher. Again of the population 25 years and over, 23.9% did not reach ninth grade, 19.5% attended some high school but did not graduate, 26.1% completed high school, 13.5% had some college with no degree, 6.2% received their Associate degree, 7.5% earned their Bachelor’s degree, and 3.2% received either their graduate or professional degree.

Although religion percentages are not available through the U.S. Census, according to the Association of Religion Data Archives in 2000 the religion with the highest number of congregations and adherents in Bristol County was Catholic with 85 congregations and 268,434 adherents. Other prominent congregations in the county were Jewish (5 with 11,600 adherents), United Church of Christ (19 with 5,728 adherents) and Episcopal (18 with 5,100 adherents). The total number of adherents to any religion was up 9.4% from 1990 (ARDA 2001).

Issues/Processes

Weaver's Cove Energy has gained approval, though subsequently legal challenges have been raised, to build a liquefied natural gas (LNG) facility in Fall River (Jefferson 2008). The LNG would be transported up the Taunton River, passing under four bridges along the way. There are concerns about the safety of people who live around the proposed facility, which could serve as a target for terrorists, and about the necessity of shutting down portions of Narragansett Bay and Mount Hope Bay to boat traffic when the tankers are moving through. Proponents argue the facility will bring tax revenue to the city (Green Futures 2007). More recently, in late 2007, the Coast Guard ruled that the waterway approach to the facility was unsuitable and presented a safety concern, which may doom the proposal; Weaver's Cove Energy filed for an appeal (Jefferson, McKinney 2007).

Cultural attributes

The Fall River Maritime Heritage trail guides visitors around historical sites displaying the city's nautical past, including Battleship Cove, a museum containing the nation's largest collection of 20th century U.S. Naval vessels. The Fall River Marine Museum, also along the heritage trail, features a large collection of model ships and other nautical memorabilia, along with the largest exhibit of artifacts from the Titanic in the United States. The city also has a variety of different ethnic festivals throughout the year, such as a Cambodian New Year festival, the Greek Festival, and several Azorean festivals, including the Great Feast of the Holy Ghost of New England, touted as the largest Azorean festival in the world (Fall River Area Chamber of Commerce & Industry 2007). "Fall River Celebrates America" is the name of an annual waterfront festival featuring live music, a parade, a Portuguese night, a talent search, and an international food fair.

The city recently received a replica of the gates to the city of Ponta Delgada, Fall River's Azorean sister city. These will be placed along the waterfront at the entrance to an area known as Crab Cove, at the eventual location of a commuter rail to Boston (azores.gov 2007).

Infrastructure

Current Economy

According to the U.S. Census 2000142, 59.1% (42,682 individuals) of the total population 16 years of age and over were in the labor force (see Figure 4), of which 4.1% were unemployed, 0.05% were in the Armed Forces, and 54.9% were employed.

142 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

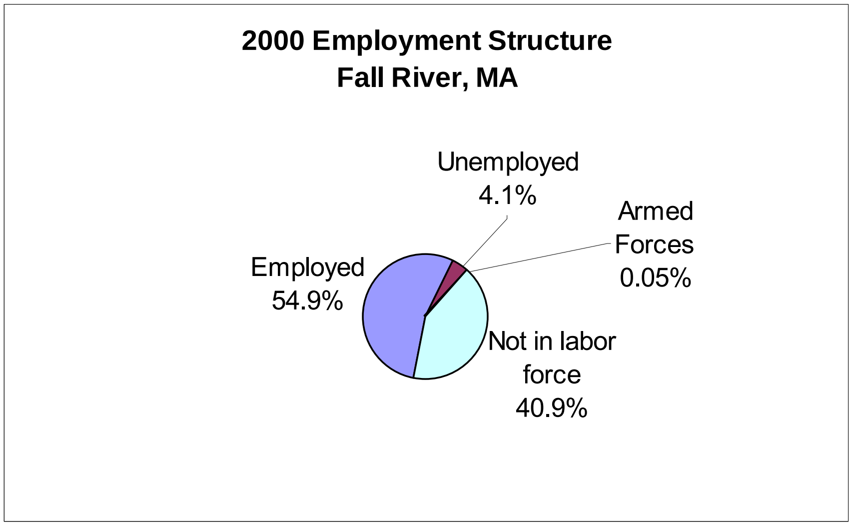

Figure 4. Employment Structure in 2000 (US Census Bureau 2000)

The largest employers in Fall River as of 2002 included: St. Anne's Hospital (1,079 employees); Labor Express (temporary staffing – 1,000 employees); Bristol Community College (760 employees); Lightolier, Inc. (lighting fixtures – 650 employees); and Joan Fabrics (600 employees) (Southeastern Regional Planning and Economic Development. 2002). The old mills today host a mix of commercial, office, and industrial uses, which have helped to revitalize Fall River's economy. Fall River's industrial park hosts close to 50 businesses with 3,500 employees. The health care industry is one of the city's largest employment sectors (Fall River Area Chamber of Commerce & Industry, Inc. 2007). In 2004 Blount Seafood relocated its headquarters and many of its processing operations to Fall River. The new facility produces soups and value-added seafood products here, while most of the traditional shellfish processing continues to take place at the company's Warren, RI facility. The new operations in Fall River were expected to create 100 new jobs (Blount Seafood 2004). According to Census 2000 data, jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 100 positions or 0.3% of all jobs. Self employed workers, a category where fishermen might be found, accounted for 1,312 positions or 3.3% of jobs. Manufacturing (24.3%) is the industry grouping that accounts for the most employment. Additionally, education, health, and social services (20.8%), retail trade (12.5%), and arts, entertainment, recreation, accommodation and food services (7.1%) were the primary industries.

Median household income in Fall River was $29,014 (up 29.2% from $22,452 in 1990 (US Census Bureau 1990a)) and median per capita income was $16,118. For full-time year round workers, men made approximately 36.9% more per year than females.

The average family in Fall River consisted of 3.0 persons. With respect to poverty, 14.0% of families (up from 12.3% in 1990 (US Census Bureau 1990a)) and 17.1% of individuals were below the U.S. Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families, depending on number of persons (2-9) (US Census Bureau 2000a). In 2000, 46.2% of all families (of any size) earned less than $35,000 per year.

In 2000, Fall River had a total of 41,857 housing units, of which 92.6% were occupied and 19.8% were detached one unit homes. More than one half (53.0%) of these homes were built before 1940. Mobile homes, boats, RVs, and vans accounted for 0.1% of housing units; 94.7% of detached units have between 2 and 9 rooms. In 2000, the median cost for a home in this area was $132,900. Of vacant housing units, 3.2% were used for seasonal, recreational, or occasional use. Of occupied units 65.1% were renter occupied.

Government

Fall River has a mayor – city council form of government (City of Fall River 2007).

Fishery involvement in government

Fall River has a Harbormaster (City of Fall River 2007) and a Shellfish Officer.

Institutional

n. Fishing associations

The New England Red Crab Harvesters Association was created in 1999 by Fall River-based red crab fishers to assist with the implementation of a federal Fisheries Management Plan for red crab. The harvesters in the association, made up of just four crab boats in Fall River, cooperate to some degree on their harvesting strategy by staggering landings so as to maintain a steady rate of processing. The Association has begun the process of having the fishery certified by the Marine Stewardship Council as sustainable, and is in the process of forming a harvest cooperative (Pinto da Silva and Kitts 2006).

The Massachusetts Fisherman's Partnership focuses on issues for fishermen in different ports in Massachusetts. The Partnership responded to the need of health care for fishermen and their families by developing the Fishing Partnership Health Insurance Plan with federal and state aid. This plan has been in place since 1997 and reduces the amount of money that fishermen's families have to pay to be covered by health insurance (Hall-Arber et al. 2001).

Fishing assistance centers

Shore Support has been the primary fishing assistance center in New Bedford since 2000 (Hall-Arber et al. 2001), though the nearby New Bedford Fishermen and Families Assistance Centers are also available as is the New Bedford-based Trawlers Survival Fund.

Other fishing-related organizations

There are several other fishing related organizations and associations that are vital to the area's fishing industry such as the Fisheries' Survival Fund in Fairhaven, the New Bedford Fishermen's Union, the New Bedford Seafood Coalition, the New Bedford Seafood Council and the Offshore Mariner's Association. Save the Bay is a non-profit organization dedicated to restoring and protecting the environmental quality of Narragansett Bay. The organization works towards this goal by monitoring the health of the Bay, initiating action to clean up the Bay, and through advocacy and education programs. Fall River worked with the Buzzard's Bay National Estuary Program, jointly administered by the Massachusetts Office of Coastal Zone Management and the EPA, to develop its first ever Open Space Plan. "While the majority of the city is heavily urbanized and drains to Mount Hope Bay; the eastern, largely undeveloped, part of the city lies within the Buzzards Bay drainage basin. Fall River's Plan focused on preservation of this area as well as coastal and recreational access" (BBNEP 2006).

Physical

Fall River lies where the Taunton River meets Mount Hope Bay. The main approaches to Fall River from the water are from the upper reaches of the Sakonnet River and from Upper Narragansett Bay, following well-marked channels. The main shipping channel lies east of the lighthouse and passes close to shore, beneath the Braga Bridge (bostonroads.com 2005). Interstate 195 and Routes 24 pass through Fall River, connecting the city with Providence, Cape Cod, Newport, and Boston. The Southeastern Regional Transit Authority operates several city buses, as well as buses to New Bedford. The Massachusetts Bay Transportation Authority has been considering extending the commuter rail service to Fall River from Boston. Bay Colony Railroad and Conrail operate freight rail service from Fall River (State of Massachusetts 2007). Peter Pan Buses also runs buses regularly from Fall River to Providence, Boston, Newport, and other area destinations. Fall River is 15 miles from New Bedford, 18 miles from Providence, and 55 miles from Boston. The nearest commercial airports are T.F. Green Airport in Warwick, RI, 26 miles away, and Logan International Airport in Boston, 55 miles from Fall River (Mapquest.com 2007). Fall River itself had a municipal airport until the mid-1990s, when it was closed due to safety concerns.

Fall River Line Pier operates the State Pier facility, with two deep water berths and a large storage facility, which receives a wide variety of cargo, including frozen fish (State of Massachusetts 2007). There is a state pier located in the area known as Crab Cove. Bucko's Parts and Tackle Service in Fall River sells fishing gear. Fall River's proximity to New Bedford means fishermen here are likely to rely on much of the commercial fishing infrastructure located in New Bedford.

Involvement in Northeast Fisheries[143]

Commercial

Atlantic Frost Seafoods is a shore-side processing facility based on a vessel docked in Fall River. They process mackerel and herring, and have a capacity of 150 tons per day. Atlantic Frost is owned by Global Fish, a Norwegian corporation which is one of the world's largest suppliers of pelagic fish . In 2004, Blount Seafood, established in 1880, relocated its headquarters and much of its value-added seafood processing operations to Fall River. Its shellfish processing operation continues to take place in Warren, RI. . There are presently four red crab vessels based in Fall River which are members of the New England Red Crab Harvesters Association (Pinto da Silva, Kitts 2006). Crabs landed here are shipped to a facility in Nova Scotia for processing (NEFMC 2005).

The landings data for Fall River show that red crab is by far the most valuable species landed here for the years 1997-2006 (see Table 1). Other important fisheries over the same time period are lobster, squid, mackerel, butterfish, and monkfish. This information paints a picture of a highly variable fishery. Landings fluctuated considerably between the years 1997-2006, from a low in 1998 to a high the following year. Landings then declined again for the next few years, but were up again. Fall River is one of only 15 ports in the Northeast landing at least 10,000lbs of skate in 2007.

The trend in home port fishing seems to follow the landings somewhat, with landings being more than two orders of magnitude higher than home port fishing in some years, but in later years the level of home port fishing increases and is closer to, but still lower than, the level of landings. It seems many of the boats landing their catch here are ported elsewhere. Interestingly, the number of home port vessels is relatively consistent in all years, as is the number of city owner vessels (see Table 2).

Landings by Species

Table 1. Rank Value of Landings for Federally Managed Groups

	Average from 1997-2006
Red Crab	1
Lobster	2
Squid, Mackerel, Butterfish	3

143 In reviewing the commercial landings data several factors need to be kept in mind. 1) While both federal and state landings are included, some states provide more detailed data to NMFS than others. For example, shellfish may not be included or data may be reported only by county and not by port. 2) Some communities did not have individual port codes until more recently. Before individual port codes were assigned, landings from those ports were coded at the county level or as an aggregate of two geographically close small ports. Where landings were coded at the county level they cannot be sorted to individual ports for those earlier years, e.g., prior to 2000. 3) Where aggregated codes were used, those aggregate codes may still exist and be in use alongside the new individual codes. Here the landings which are still assigned to the aggregate port code cannot be sorted into the individual ports, so port level data are only those which used the individual port code. 4) Even when individual port codes exist, especially for small ports, landings may be coded at the county level. Here again it is impossible to disaggregate these to a port level, making the port level landings incomplete. 5) In all these cases, the per port data in this profile may under report the total level of landings to the port, though all landings are accounted for in the overall NMFS database.

Monkfish	4
Summer Flounder, Scup, Black Sea Bass	5
Other144	6
Herring	7
Skate	8
Largemesh Groundfish145	9
Dogfish	10
Smallmesh Groundfish146	11
Surf Clams, Ocean Quahog	12
Bluefish	13
Tilefish	14

(Note: Only rank value is provided because value information is confidential in ports with fewer than three vessels or fewer than three dealers, or where one dealer predominates in a particular species and would therefore be identifiable.)

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144 "Other" species includes any species not accounted for in a federally managed group

145 Largemesh groundfish: cod, winter flounder, yellowtail flounder, American plaice, sand-dab flounder, haddock, white hake, redfish, and pollock

146 Smallmesh multi-species: red hake, ocean pout, mixed hake, black whiting, silver hake (whiting)

Vessels by Year[147]

Table 18. Federal Vessel Permits Between 1997-2006

Year	# Vessels (home ported)	# Vessels (owner's city)
1997	7	7
1998	5	6
1999	7	7
2000	6	8
2001	6	7
2002	6	8
2003	6	5
2004	6	5
2005	6	5
2006	6	8

 # Vessels home ported = No. of permitted vessels with location as homeport
 # Vessels (owner's city) = No. of permitted vessels with location as owner residence[148]
Level of fishing home port ($) = Landed value of fisheries associated with home ported vessels
Level of fishing landed port ($) = Landed value of fisheries landed in location

Recreational

One of the Massachusetts Saltwater Fishing Derby Official Weigh Stations is located at Main Bait & Tackle in Fall River. This is one of four bait and tackle shops in Fall River. Fall River also has a jetty and a ramp with paved access, which are usable at all tides (State of Massachusetts 2007). There is also a Fall River Junior Bassmasters **club, though it operates out of Cambridge, MA (60 miles away).**

Subsistence

Hall-Arber et al. (2001) notes that "lots of the people who participate in recreational fishing in Tiverton are Cambodian or have other ethnic backgrounds." Some of this "recreational" activity may actually support a fisheries-based subsistence life style (Hall-Arber 2001)." Tiverton, RI is only 8 miles from Fall River and many of these Cambodian fishermen probably reside in Fall River, given Fall River's Cambodian population and the fact that that Tiverton's 2000 population was 98% white and the "Other Asian" category (where Cambodians would be found) was composed fewer than 5 people. Subsistence fishing out of Fall River is known to occur, but the extent of this activity cannot be estimated with any degree of accuracy.[149]

FUTURE

As of February 2007, "Fall River [was] in the final phase of its comprehensive Harbor Plan. With funding provided by the state, the city commissioned consultants to formulate a definitive marketing and development

147 Numbers of vessels by owner's city and homeport are as reported by the permit holder on permit application forms. These may not correspond to the port where a vessel lands or even spends the majority of its time when docked.
148 The Owner-City from the permit files is technically the address at which the owner receives mail concerning their permitted vessels, which could reflect the actual location of residence, the mailing address as distinct from residence, owner business location, or the address at which a subsidiary receives mail about the permits.
149 Profile review comment, Vin Malkowski, MA Division of Marine Fisheries, October 5, 2007

blueprint for the waterfront and downtown districts. Implementation has already begun. An extended boardwalk has been completed and the state has committed funding for the overhaul of the State Pier as a marine-related mixed use development." The city has been working on the plan since 1997.150 The Commerce Park in Fall River will soon hold large facilities for Main Street Textiles and the TJX Corporation, creating 1,600 new jobs for the city (Fall River Area Chamber of Commerce & Industry, Inc 2007).

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150 Profile review comment, Vin Malkowski, MA Division of Marine Fisheries, October 5, 2007

h. NEWPORT, RI[151]

Community Profile[152]

P. PEOPLE AND PLACES

Regional orientation

Newport, Rhode Island (41.50°N, 71.30°W) (USGS 2008) is located at the southern end of Aquidneck Island in Newport County. The city is located 11.3 miles from Narragansett Pier, 59.7 miles from Boston, MA, and 187 miles from New York City.

Map 1. Location of Newport, RI (US Census Bureau 2000a)

Historical/Background

English settlers founded Newport in 1639 (City of Newport nd). Although Newport's port is now mostly dedicated to tourism and recreational boating, it has had a long commercial fishing presence. In the mid 1700s, Newport was one of the five largest ports in colonial North America and until Point Judith's docking facilities were developed it was the center for fishing and shipping in Rhode Island (Hall-Arber et al. 2001; RIEDC 2008).

Between 1800 and 1930, the bay and inshore fleet dominated the fishing industry of Newport. Menhaden was the most important fishery in Newport and all of Rhode Island until the 1930s when the fishery collapsed. At this time the fishing industry shifted to groundfish trawling. The use of the diesel engine, beginning in the 1920s, facilitated fishing farther from shore than was done in prior years (Hall-Arber et al. 2001).

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151 These community profiles have been created to serve as port descriptions in Environmental Impact Statements (EISs) for fisheries management actions. They also provide baseline information from which to begin research for Social Impact Assessments (SIAs). Further, they provide information relevant to general community impacts for National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and information on minorities and low income populations for Executive Order (E.O.) 12898 on Environmental Justice.

152 For purposes of citation please use the following template: "Community Profile of *Town, ST*. Prepared under the auspices of the National Marine Fisheries Service, Northeast Fisheries Science Center. For further information contact Lisa.L.Colburn@noaa.gov."

i. *Demographics*[153]

According to Census 2000 data, Newport had a total population of 26,475, down 6.2% from the reported population of 28,227 in 1990 (US Census Bureau 1990). Of this 2000 total, 48.2% were males and 51.8% were females. The median age was 34.9 years and 73.4% of the population was 21 years or older while 14.8% of the population was 62 or older.

Unlike many fishing communities, Newport's age structure (see Figure 1) is skewed to some degree to the younger age groups; the largest percentage of the population found in the age group from 20 to 29, which in part reflects the presence of the nearby naval base. Gender balance is fairly even until age 70 and above.

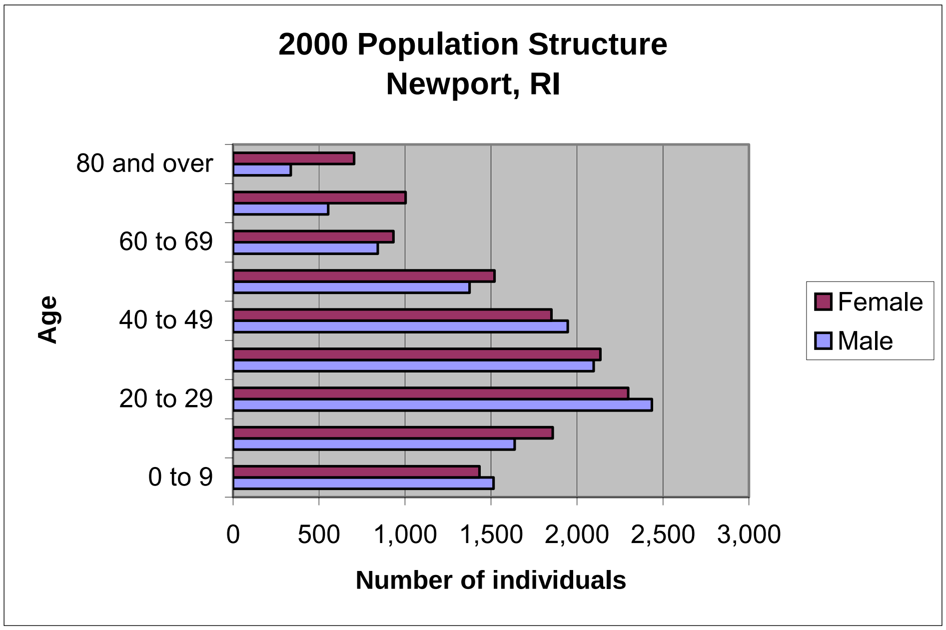

Figure 1. Newport's population structure by sex in 2000 (US Census Bureau 2000)

The majority of the population was White (87.2%), with 8.1% Black or African American, 1.3% Asian, 0.8% Native American, and 0.1% Pacific Islander or Hawaiian (see Figure 2). Only 5.5% of the population identified themselves as Hispanic/Latino (see Figure 3). Residents linked their backgrounds to a number of different ancestries including: Irish (27.8%), English (12.9%), Italian (11.4%) and Portuguese (7.3%). With regard to region of birth, 45.6% were born in Rhode Island, 46.7% were born in a different state and 5.6% were born outside of the U.S. (including 2.9% who were not United States citizens).

153 While mid-term estimates are available for some larger communities, data from the 2000 Census are the only data universally available for the communities being profiled in the Northeast. Thus for cross-comparability we have used 2000 data even though these data may have changed significantly since 2000 for at least some communities.

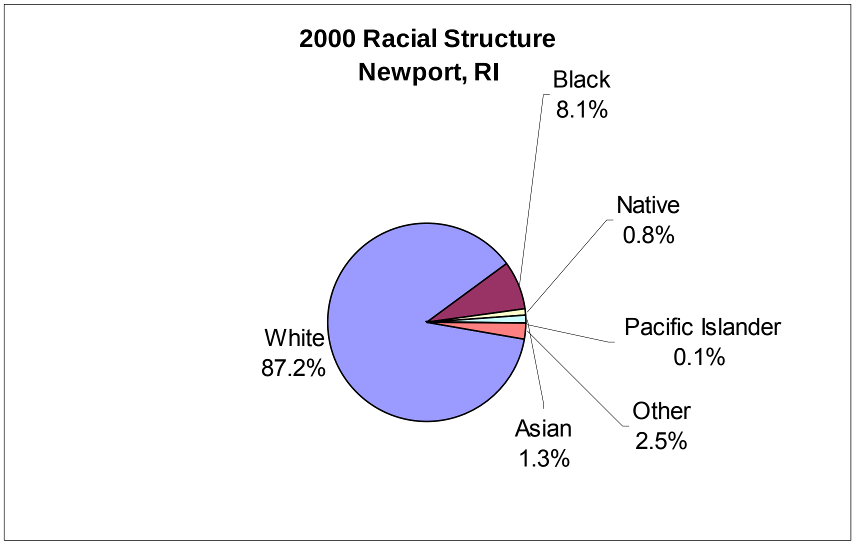

Figure 2. Racial Structure in 2000 (US Census Bureau 2000)

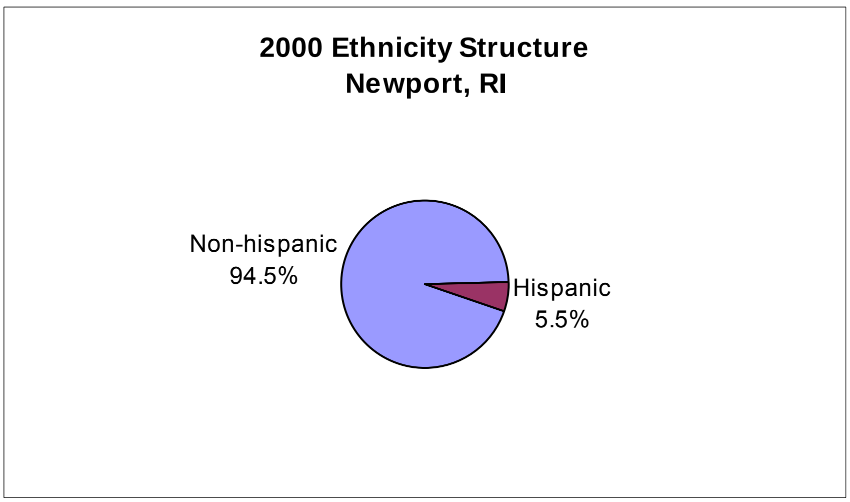

Figure 3. Ethnic Structure in 2000 (US Census Bureau 2000)

For 90.4% of the population, only English was spoken in the home, leaving 9.6% in homes where a language other than English was spoken, including 3.6% of the population who spoke English less than 'very well' according to the 2000 Census.

Of the population 25 years and over, 21.4% were high school graduates or higher and 26.3% had a bachelor's degree or higher. Again of the population 25 years and over, 4.5% did not reach ninth grade, 8.4% attended some high school but did not graduate, 21.4% completed high school, 18.7% had some college with no degree, 5.5% received their associate's degree, 26.3% earned their bachelor's degree, and 15.1% received either their graduate or professional degree.

Although religion percentages are not available through U.S. Census data, according to the Association of Religion Data Archives (ARDA) in 2000, the religion with the highest number of congregations and adherents in Newport County was Catholic with 13 congregations and 68,668 adherents. Other prominent congregations in the county were Episcopal (10 with 4,720 adherents), and American Baptist (15 with 3,022 adherents). The total number of adherents to any religion was up 57.3% from 1990 (ARDA 2000).

ii.Issues/Processes

Like other fishing communities in the Northeast, Amendment 13 brought significant changes to the local fishing industry. This amendment attempts to rebuild groundfish stocks by decreasing the allowed fishing days at sea, simplifying what was a complicated schedule of allowed fishing days mixed with restricted fishing areas. In addition to Amendment 13, pollution impacts, an increase in tourism, increasing property values, and competition with recreational vessel for limited wharf space restrict fishing industry infrastructure and contribute to the decline of the Newport's fleet (Hall-Arber et al. 2001).

q. Cultural attributes

With such a diverse background, the city of Newport makes every effort to embrace its heritage through the many festivals that the city holds. One of the major events for the city is The Tall Ships Rhode Island. The event includes tours of historic national and international Tall Ships, an international marketplace, and family entertainment. The Great Chowder Cook Off and the Taste of Rhode Island festivals both celebrate the region's past and present ties with the fishing industry, at least indirectly, through a celebration of the state's culinary heritage (NHC nd).

For a weekend in September, the city celebrates Irish music, culture, cuisine, and crafts. The Newport Waterfront Irish Festival provides quality family entertainment in the heart of Newport's beautiful historic waterfront. This three day community celebration features five stages of national and international entertainment, the Special Event Community Tent, Travel to Ireland exhibits, an Irish Marketplace with Irish and handcrafted items for sale, a dance hall, and children's play area (NHC nd).

Newport Kids Fest - Maritime Fair is another event that remembers the city's maritime history. The event is hosted by the Museum of Yachting as part of the broader Kids Fest and includes many maritime related activities including knot tying, lobster races, model boat kits, coast guard safety, and navigation (Rourke 2004).

The annual Blessing of the Fleet takes place in early December as part of the Christmas in Newport festival, and includes a parade by both commercial and recreational vessels decorated for the holidays. The city also celebrates both Irish Heritage Month (HPHC 2008) and Oktoberfest (NHC nd) to remember and embrace its roots.

Infrastructure

Current Economy

Omega Sea (USFDA 2008) Aquidneck Lobster Co., Dry Dock Seafood, International Marine Industries Inc., Long Wharf Seafood, Neptune Trading Group Ltd., and Parascandolo and Sons Inc. are wholesalers and retailers of seafood in Newport. Parascandolo and Sons Inc. owns a privately operated pier used primarily by the large mesh multispecies fleet, but also lands substantial amounts of squid. According to the NMFS Port Agent, Parascandolo requires a high volume of product in order to maintain their waterfront business, regardless of whether it is purchased or packed out.[154] Nordstrom Trading Company, one of Rhode Island's two largest bait skate dealers moved his offloading facilities to the Newport state Pier in 2008[155].

According to the U.S. Census 2000[156], 70.1% (15,266 individuals) of the total population 16 years of age and over were in the labor force (see Figure 4), of which 4.7% were unemployed, 7.3% were in the Armed Forces, and 58.1% were employed.

154 Community Review Comments, Walter Anoushian, NMFS Port Agent, January 31, 2008

155 Interviews with Dan Nordstom, owner of Nordstrom Trading Co., October 23, 2008, and Walter Anoushian, NMFS port agent in Point Judith on October 16, 2008 by Patricia M. Clay of NMFS Northeast Fisheries Science Center.

156 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

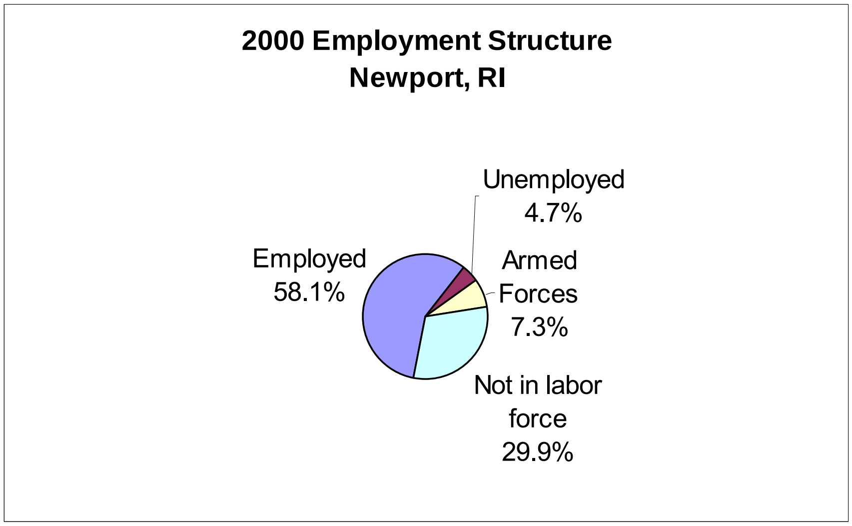

Figure 4. Employment structure in 2000 (US Census Bureau 2000)

According to Census 2000 data, jobs in the census groupings which includes agriculture, forestry, fishing and hunting, and mining accounted for 91 positions or 0.7% of all jobs. Self employed workers, a category where fishermen might be found, accounted for 1,056 positions or 8.3% of jobs. Educational, health and social services (19.9%), arts, entertainment, recreation, accommodation and food services (18.6%), professional, scientific, management, administrative, and waste management services (12.3%), retail trade (10.9%), and manufacturing (7.2%) were the primary industries.

The median household income in Newport was $40,669, up 33.2% from $30,534 in 1990 (US Census Bureau 1990) and median per capita income was $25,441. For full-time year round workers, males made approximately 27.2% more per year than females.

The average family in Newport consisted of 2.86 persons. With respect to poverty, 12.9% of families, up from 10.0% in 1990 (US Census Bureau 1990) and 14.4% of individuals earned below the U.S. Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families, depending on number of persons (2-9) (US Census Bureau 2000b). In 2000, 32.4% of all families (of any size) earned less than $35,000 per year.

In 2000, Newport had a total of housing 13,266 units of which 87.4% were occupied and 37.3% were detached one unit homes. Approximately half (54.4%) of these homes were built before 1940. Mobile homes and boats accounted for no housing units; 88.9% of detached units had between 2 and 9 rooms. In 2000, the median cost for a home in this area was $161,700. Of vacant housing units, 51.7% were used for seasonal, recreational, or occasional use. Of occupied units, 58.1% were renter occupied.

Government

The city of Newport is governed through a Council/City Manager form of government. There are seven members; one representative is elected from the City's four voting wards and three are elected at-large, all for two year terms. The Mayor is elected by the Council from among the three at-large councilors (City of Newport 2008).

Fishery involvement in the government

Newport has both a Harbormaster and a NMFS Port Agent based in the town.

Institutional

Fishing associations

There are several fishing associations which aid the fishing industry in Newport. The Ocean State Fishermen's Association is located in Barrington; the Rhode Island Commercial Fishermen's Association and the Rhode Island Lobstermen's Association are in Wakefield; and the Massachusetts Lobstermen's Association is in Scituate, Massachusetts. The State Pier 9 Association and Atlantic Offshore Fishermen's Association are involved in the Newport's fishing industry (Hall-Arber et al. 2001).

Fishery assistance centers

Information on fishing assistance centers in Newport is unavailable through secondary data collection.

Other fishing related organizations

The Rhode Island Seafood Council is located in Charlestown. The Seamen's Church Institute is an organization that brings soup around to the docks for workers and fishermen.

The Commercial Fisheries Center of Rhode Island was founded in 2004 and is home to nonprofit commercial fishing organizations, and serves "as a headquarters for bringing fishermen, scientists, managers, and elected officials together to discuss issues." The goals of the center are "to improve fisheries and understanding of the marine environment through education, collaborative research, and cooperation" (CFC nd).

Physical

There are several ways to access Newport and to travel within the city. The Rhode Island Public Transit Authority (RIPTA) buses, and state highway systems provide public access to the city. RIPTA trolleys are generally used to visit Newport. RIPTA's Providence/Newport Water Ferry in Narragansett Bay connects Providence's Point Street Landing and Newport's Perrotti Park (RIPTA nd). The Rhode Island state airport, the Theodore Francis Green airport, is located in Providence. There are three Amtrak stations in Rhode Island, in Kingston, Westerly, and Providence.

As for fishing infrastructure, Newport has the State Pier #9 which is the only state owned facility for commercial fishing in Newport Harbor, providing dockage for approximately 60 full-time fishing vessels primarily used by the lobster fleet (RIDEM 2007). There are also three saltwater boat launces in Newport (RIDEM 2005a).

r. ***INVOLVEMENT IN NORTHEAST FISHERIES***157

Commercial

The South of Cape Cod midwater trawl fleet (pair and single) consists of eight vessels with principal ports of New Bedford, MA; Newport, RI; North Kingstown, RI; and Point Judith, RI. This sector made 181 trips and landed 17,189 metric tons of herring in 2003. Maine had the highest reported landings (46%) in 2003, followed by Massachusetts (38%), New Hampshire (8%), and Rhode Island (7%) (NEFMC 2004).

Newport has a highly diverse fishery. Of the federal landed species, scallop had the highest value in 2006, at over $13 million. The average value of scallop landings for 1997-2006 was just over $2.5 million; 2006 landings represent a more than five-fold increase over this average value. Lobster was the most valuable species on average, worth more than $2.7 million on average, and close to $3 million in 2006. The squid, mackerel, and butterfish grouping, largemesh groundfish, and monkfish were all valuable fisheries in Newport (see Table 1). The value of landings for home ported vessels in Newport was relatively consistent from 1997-2006, with a high of just under $8 million in 2003 (see Table 2). The level of landings in Newport was steady from 1997-2004, and then saw enormous increases in 2005 and 2006, to almost $21 million in 2006. Home ported vessels in Newport declined from a high of 59 in 2000 to 48 in 2006, while the number of vessels with owners living in Newport increased from 13 in 1997 to 18 in 2006; this implies that most vessels home ported in Newport have owners residing in other communities. There were 6 dealers in Newport in 2007 that bought skate.

Landings by Species

Table 19. Dollar value by Federally Managed Groups of Landings in Newport

	Average from 1997-2006	2006 only
Lobster	2,758,908	2,971,680
Scallop	2,528,448	13,267,494
Squid, Mackerel, Butterfish	1,425,947	1,315,229
Largemesh Groundfish158	1,039,962	445,273
Monkfish	878,265	1,068,547
Summer Flounder, Scup, Black Sea Bass	739,880	815,918
Other 159	334,103	401,779
Smallmesh Groundfish160	179,296	43,165
Skate	58,481	224,184

157 In reviewing the commercial landings data several factors need to be kept in mind. 1) While both federal and state landings are included, some states provide more detailed data to NMFS than others. For example, shellfish may not be included or data may be reported only by county and not by port. 2) Some communities did not have individual port codes until more recently. Before individual port codes were assigned, landings from those ports were coded at the county level or as an aggregate of two geographically close small ports. Where landings were coded at the county level they cannot be sorted to individual ports for those earlier years, e.g., prior to 2000. 3) Where aggregated codes were used, those aggregate codes may still exist and be in use alongside the new individual codes. Here the landings which are still assigned to the aggregate port code cannot be sorted into the individual ports, so port level data are only those which used the individual port code. 4) Even when individual port codes exist, especially for small ports, landings may be coded at the county level. Here again it is impossible to disaggregate these to a port level, making the port level landings incomplete. 5) In all these cases, the per port data in this profile may under report the total level of landings to the port, though all landings are accounted for in the overall NMFS database.

158 Largemesh groundfish: cod, winter flounder, witch flounder, yellowtail flounder, am. plaice, sand-dab flounder, haddock, white hake, redfish, and pollock

159 “Other” species includes any species not accounted for in a federally managed group

160 Smallmesh Multi-Species: red hake, ocean pout, mixed hake, black whiting, silver hake (whiting)

	Average from 1997-2006	2006 only
Herring	42,538	267,164
Dogfish	26,441	6,037
Red Crab	15,560	0
Bluefish	11,759	9,878
Tilefish	9,230	1,213

Vessels by Year161

Table 20. All columns represent Federal Vessel Permits or Landings Value between 1997 and 2006

Year	# Vessels (home ported)	# Vessels (owner's city)	Level of fishing home port ($)	Level of fishing landed port ($)
1997	52	13	5,130,647	7,598,103
1998	52	16	6,123,619	8,196,648
1999	52	14	6,313,350	8,740,253
2000	59	14	6,351,986	8,296,017
2001	52	15	5,813,509	7,485,584
2002	55	17	6,683,412	7,567,366
2003	52	16	7,859,848	9,082,560
2004	52	15	5,951,228	8,402,556
2005	54	17	6,012,472	14,281,505
2006	48	18	6,811,060	20,837,561

(Note: # Vessels home ported = No. of permitted vessels with location as homeport
 # Vessels (owner's city) = No. of permitted vessels with location as owner residence162
Level of fishing home port ($) = Landed value of fisheries associated with home ported vessels
Level of fishing landed port ($) = Landed value of fisheries landed in location)

i.Recreational

There is a large recreational fishing sector in Rhode Island. "In Rhode Island, nearly 362,000 recreational marine anglers – more than half from out-of-state – made over 1.5 million trips, catching 4.3 million pounds of sport fish and releasing about 55 percent in 2004" (RIDEM 2004). A 2005 survey by the RI Dept. of Environmental Management showed Newport to be one of the three most popular sites in the state for shore based recreational saltwater fishing (RIDEM 2005). Recently more sub-tropical and tropical species have been found off Newport (Mooney 2006).

ii.Subsistence

Information on subsistence fishing in Newport is either unavailable through secondary data collection or the practice does not exist.

161 Numbers of vessels by owner's city and homeport are as reported by the permit holder on permit application forms. These may not correspond to the port where a vessel lands or even spends the majority of its time when docked.
162 The Owner-City from the permit files is technically the address at which the owner receives mail concerning their permitted vessels, which could reflect the actual location of residence, the mailing address as distinct from residence, owner business location, or the address at which a subsidiary receives mail about the permits.

FUTURE

From interviews collected for the "New England Fishing Communities" report, Hall-Arber and others (2001) found that fishermen fear that increasing tourism and cruise ships will cause the State Pier 9 to be used more for tourism rather than a harbor for commercial fishing, as the fishing industry is far from being a major economic input to Newport. Until 1973, Newport was Rhode Island's fishing and shipping center. For example, in 1971 over half of the state's total commercial fisheries landings were in Newport. In 1973, Point Judith became and presides as the most important commercial port in the state (Griffith and Dyer 1996).

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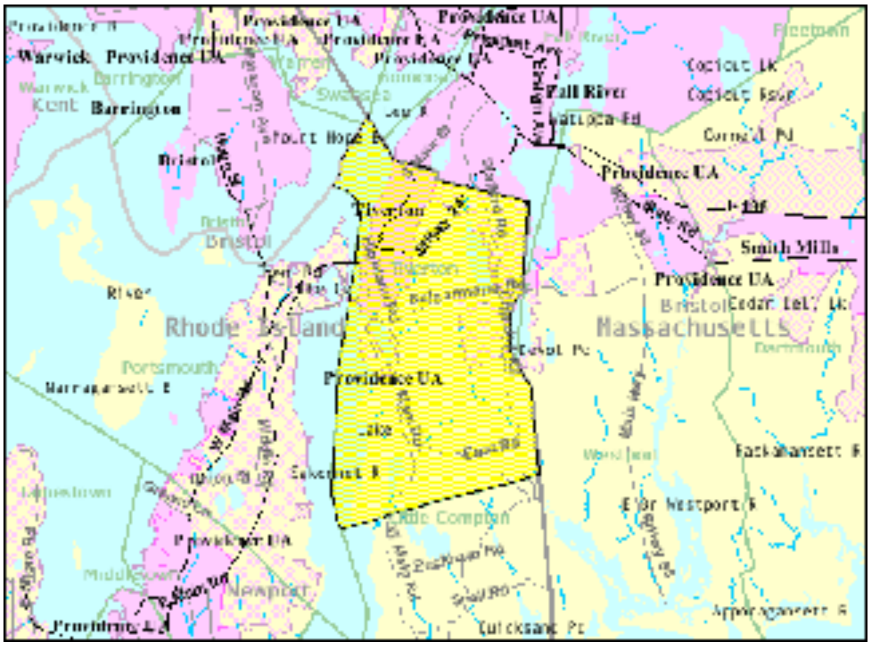
i. TIVERTON, RI[163]

Community Profile[164]

People and Places

Regional orientation

The Town of Tiverton (41.63º N, 71.21º W) is located in Southeastern Rhode Island in Newport County, along the Massachusetts border. It borders Fall River and Westport, MA and has a total land area of the town is 29.6 square miles. Tiverton is located along the Sakonnet River, part of Narragansett Bay (USGS 2008).



Map 1. Location of Tiverton, RI (US Census Bureau 2000)

Historical/Background

The town of Tiverton was named after Tiverton, England. "Tiverton was originally incorporated in 1694, as part of the Massachusetts Bay Colony. A long boundary dispute between Rhode Island and Massachusetts was settled in 1746, and Tiverton, by Royal Decree, together with the Towns of Cumberland, Barrington, Bristol and Little Compton was annexed to Rhode Island. The town was incorporated in 1747. For approximately three years during the Revolution when the British held Aquidneck Island, Tiverton was an asylum for Americans fleeing from British occupation, and the town became a mustering point for Colonial forces who gathered together to drive the British off the island. In its early day, Tiverton was chiefly a farming community with some fishing and boat construction. Until 1900 the manufacture of menhaden oil, a fish derivative, was one of the primary industrial

163 These community profiles have been created to serve as port descriptions in Environmental Impact Statements (EISs) for fisheries management actions. They also provide baseline information from which to begin research for Social Impact Assessments (SIAs). Further, they provide information relevant to general community impacts for National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and information on minorities and low income populations for Executive Order (E.O.) 12898 on Environmental Justice.
164 For purposes of citation please use the following template: "Community Profile of *Town, ST*. Prepared under the auspices of the National Marine Fisheries Service, Northeast Fisheries Science Center. For further information contact Lisa.L.Colburn@noaa.gov."

pursuits. Cotton and woolen mills were established as early as 1827. Today, trade establishments are the major employers in the town. Recent years have seen Tiverton grow as a summer resort and residential area. Development has been concentrated in the area known as North Tiverton" (Town of Tiverton nd). North Tiverton borders Fall River and is densely populated.

Demographics ***165***

According to Census 2000 data166, Tiverton had a total population of 15,260, up 110.2% from the reported population of 7,259 in 1990 (US Census Bureau 1990). Of this 2000 total, 48.7% were male and 51.3% were female. The median age was 40.8 years and 75.1% of the population was 21 years or older while 19.3% was 62 or older.

The population structure of Tiverton (see Figure 1) shows the most populous age group for both men and women was the 40-49 year old grouping, followed closely by both the 30-39 and 50-59 age groups. The age structure showed a dip in population for both men and women in the 20-29 age bracket, indicating an out-migration of young people moving elsewhere for college and/or to seek jobs that is common in many fishing communities.

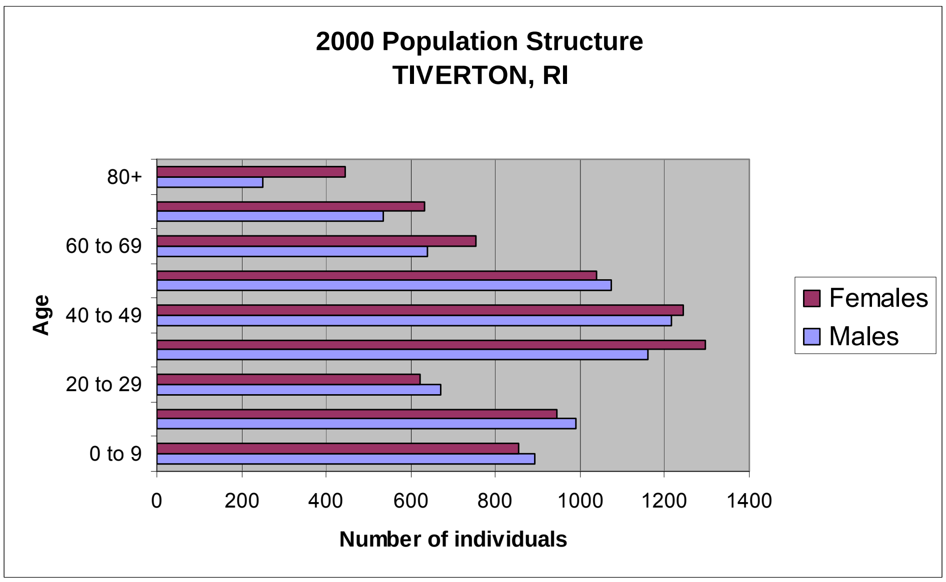


Figure 1. Tiverton's population structure by sex in 2000 (US Census Bureau 2000)

The majority of the population was white (97.9%), with 0.6% of residents black or African American, 0.6% Asian, 0.6% Native American, and 0.1% Pacific Islander or Hawaiian (see Figure 2). Only 0.7% of the total population identified themselves as Hispanic/Latino (see Figure 3). Residents linked their backgrounds to a number of different ancestries including: Portuguese (31.3%), Irish (16.3%), French (14.4%), and English (14.3%). With regard to region of birth, 19.8% were born in Rhode Island, 75.6% were born in a different state and 4.1% were born outside of the U.S. (including 1.3% who were not United States citizens).

165 While mid-term estimates are available for some larger communities, data from the 2000 Census are the only data universally available for the communities being profiled in the Northeast. Thus for cross-comparability we have used 2000 data even though these data may have changed significantly since 2000 for at least some communities.
166 These and all census data, unless otherwise referenced, can be found at U.S. Census: American Factfinder 2000 http://factfinder.census.gov/home/saff/main.html; census data used are for Tiverton town, Newport County RI (accessed July 2, 2007)

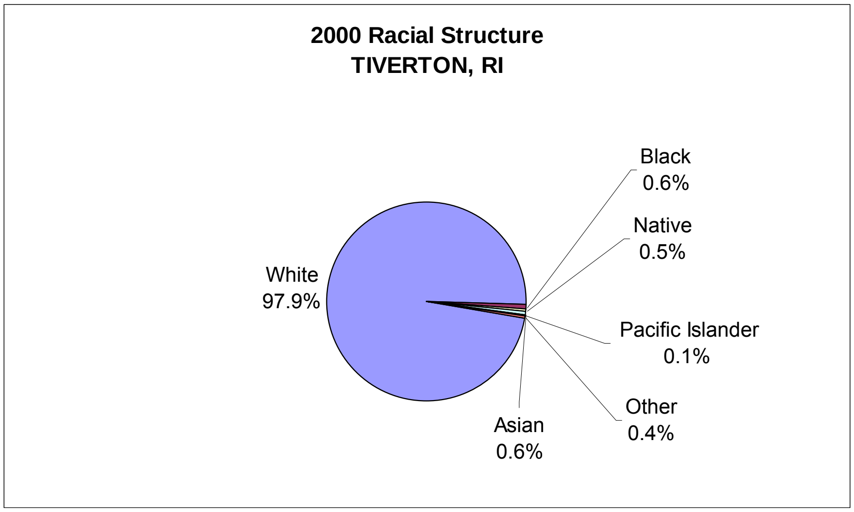


Figure 2. Racial Structure in 2000 (US Census Bureau 2000)

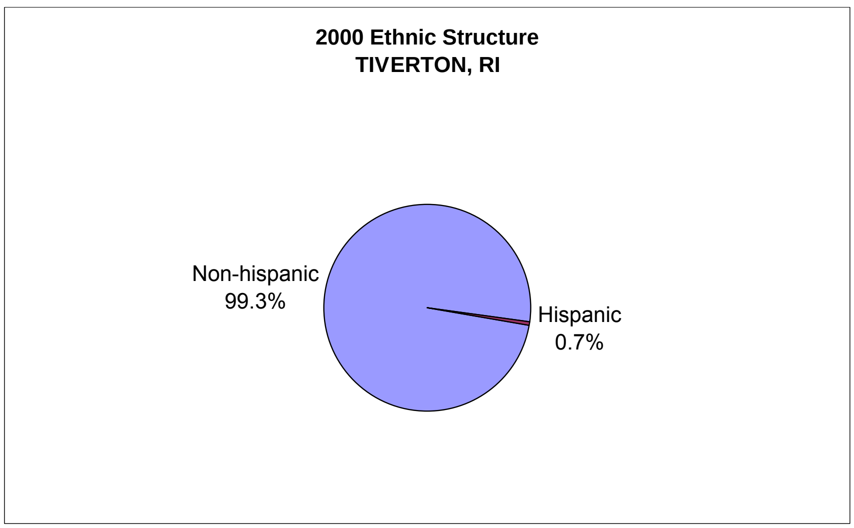


Figure 3. Ethnic Structure in 2000 (US Census Bureau 2000)

For 89.7% of the population, only English was spoken in the home, leaving 10.3% in homes where a language other than English was spoken, and including 2.8% of the population who spoke English less than "very well" according to the 2000 Census.

Of the population 25 years and over, 79.5% were high school graduates or higher and 24.0% had a bachelor's degree or higher. Again of the population 25 years and over, 8.5% did not reach ninth grade, 11.9% attended some high school but did not graduate, 29.6% completed high school, 18.7% had some college with no degree, 7.2% received an associate's degree, 14.7% earned a Bachelor's degree, and 9.3% received either a graduate or professional degree.

Although religion percentages are not available through U.S. Census data, according to the Association of Religion Data Archives in 2000, the religions with the highest number of congregations in Newport County was Catholic with 13 congregations and over 68,668 adherents. Other prominent congregations in the county were Episcopal (10 with 4,720 adherents), and American Baptist (15 with 3,022 adherents). The total number of adherents to any religion was up 57.3% from 1990 (ARDA 2000). There are twelve houses of worship listed in Tiverton, of which four are Catholic, one is Mormon, and the rest are various Protestant denominations (Town of Tiverton nd).

Issues/Processes

Like many coastal communities in the area, Tiverton has a problem with loss of waterfront access (Sakonnet Times 2004b). A property known as Manchester's, which has been in the past leased to fishing companies for use as a wholesale and retail market, and where a number of fishing vessels were docked, was sold in 2005 to a couple who intend to develop this area for retail and tourism (East Bay Newspapers 2005). The local ice man has moved to Fall River. Gear Lockup, a fishing gear store, has closed. Nordstrom Trading Company (a fish dealer) had to move from its original buying location due to high waterfront prices; a yacht now docks there and Nordstrom Trading buys from the Newport State pier.167

A highly controversial proposal in this area is one to bring liquid natural gas (LNG) tankers into Fall River, which borders Tiverton. These tankers would have to pass closeby a segment of Tiverton's shore (Sakonnet Times 2004a). In addition to the safety concerns over having LNG tankers in the area, this would possibly present an access problem for fishermen in Narragansett Bay, as security regulations surrounding the tanker would restrict the use of part of the bay as the tankers are passing through. This would also require dredging parts of the bay to allow the tanker to pass through, a plan that Save the Bay, an organization dedicated to the protection of Narragansett Bay, claims would hurt the area's already sensitive fisheries (Sakonnet Times 2005).

The community is also contending with a couple of proposed large-scale retail developments in the town, and many residents are concerned about this and future plans for developing here, and their potential to change the character of the community (Town of Tiverton nd). The Stone Bridge, formerly a bridge and currently used as a fishing pier, was damaged in a 2005 storm. The town received federal funding to repair the structure, which protects Tiverton Basin (where the town's harbor is located) from storm waves coming up the length of the Sakonnet River (Burdett 2004).

Under Amendment 3 to the Skate FMP a concern is that juvenile Winter skate (defined as overfished) can be mistaken for juvenile Little Skate (which is not overfished). However, both observer data and the owner of The Bait Company, Andrea Incollingo (who was trained to distinguish between the two species by a NMFS staff member when she began her business in 1984), agree that when there are Winter Skate present it is in small amounts – 5-10% (Incollingo, pers. comm.).

Most skate landed in Point Judith is whole skate bait, though some wings and whole skate are also landed. Bait in October of 2008 goes for 10 cents a pound for lobstermen. Wings for food go for 50-70 cents. To go skate fishing you have to be under groundfish (multispecies) Days-at-Sea (DAS), and with those DAS dwindling people don't want to commit the time for a 10 cent fishery so there is a big impact on lobster fishery. There used to be a number of vessels targeting skate, but now it is mostly some smaller boats bringing in small amounts of bycatch with their groundfish. This is an issue for bait dealers and for lobstermen (Anoushian, pers. comm.).

iii.Cultural attributes

The Tiverton Four Corners village hosts a number of art-related festivals throughout the year (Tiverton4Corners nd), but little in the way of fishing related cultural events.

Infrastructure

Current Economy

According to the U.S. Census 2000168, 63.4% (8,247 individuals) of the total population 16 years of age and over were in the labor force (see Figure 4), of which 3.4% were unemployed, 0.2% were in the Armed Forces, and 63.4% were employed.

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167 Interview with Dan Nordstom, owner of Nordstrom Trading Co., October 23, 2008, by Patricia M. Clay of NMFS Northeast Fisheries Science Center.

168 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

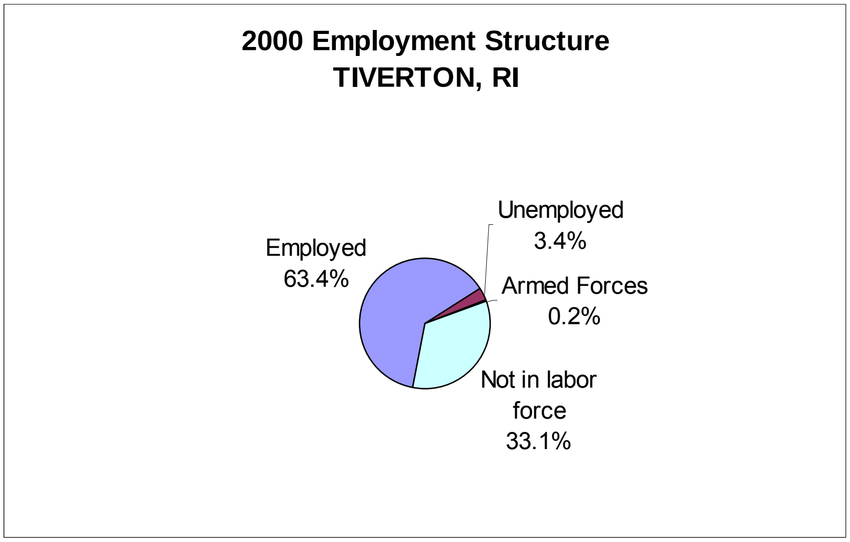

Figure 4. Employment Structure in 2000 (US Census Bureau 2000)

The largest employers in Tiverton in 2004 were the Town of Tiverton (400 employees) and LIFE (235 employees) which provides group home support for persons with disabilities (RIEDC 2004).

Tiverton had an aquaculture facility, Eastern Fish, which closed in 2000; the facility mostly produced hydroponically grown lettuce, however (NBEP nd). Most of the seafood landed in processed in Tiverton is shipped elsewhere, to Boston, New York, or across the country (Hall-Arber et al. 2001).

According to Census 2000 data, jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 94 positions or 1.2% of all jobs. Self employed workers, a category where fishermen might be found, accounted for 426 positions or 5.5% of jobs. Education, health, and social services (23.8%), manufacturing (12.7%), and retail trade (12.4%) were the primary industries. Median household income in Tiverton was $49,977 (up 43.7% from $34,787 in 1990 [US Census Bureau 1990]) and per capita income was $22,866. For full-time year round workers, males made approximately 40.5% more per year than females.

The average family in Tiverton consisted of 2.95 persons. With respect to poverty, 2.9% of families (down from 3.2% in 1990 [US Census Bureau 1990]) and 4.5% of individuals earned below the official U.S. Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families, depending on number of persons (2-9) (US Census Bureau 2000b). In 2000, 22.6% of all families (of any size) earned less than $35,000 per year.

In 2000, Tiverton had a total of 6,474 housing units of which 93.3% were occupied and 77.6% were detached one unit homes. Just over 20% (20.6%) of these homes were built before 1940. Mobile homes accounted for 4.2% of the total housing units; 91.0% of detached units had between 2 and 9 rooms. In 2000, the median cost for a home in this area was $144,400. Of vacant housing units, 3.0% were used for seasonal, recreational, or occasional use. Of occupied units 20.1% were renter occupied.

Government

Tiverton has a Town Meeting form of government with a seven-member Town Council and a Town Clerk (Town of Tiverton nd).

Fishery involvement in government

Tiverton has a **Harbor & Coastal Waters Management** Commission which always includes a member of the Planning Board, and also has waterfront zoning for water-dependent commercial uses (Town of Tiverton nd). The town also has a harbormaster.

Institutional

Fishing associations

The Rhode Island Saltwater Anglers' Association is dedicated to the conservation of the marine environment and of fisheries, and to protecting the rights of saltwater recreational fishermen in Rhode Island. Rhode Island has several other fishery associations to which fishermen in Tiverton might belong, including: the Ocean State Fishermen's Association, the Rhode Island Shellfishermen's Association, the Rhode Island Inshore Fishermen's Association, and the Rhode Island Commercial Fishermen's Association (RIMRU 2002).

15.1.11.1. Fishing assistance centers

Information on fishing assistance centers in Tiverton is unavailable through secondary data collection.

15.1.11.2. Other fishing-related institutions

Save the Bay is a non-profit organization dedicated to restoring and protecting the environmental quality of Narragansett Bay. The organization works towards this goal by monitoring the health of the Bay, initiating action to clean up the Bay, and through advocacy and education programs.

The Commercial Fisheries Center of Rhode Island was founded in 2004 and is home to nonprofit commercial fishing organizations, and serves "as a headquarters for bringing fishermen, scientists, managers, and elected officials together to discuss issues." The goals of the center are "to improve fisheries and understanding of the marine environment through education, collaborative research, and cooperation."

Physical

The southern portion of Tiverton for the most part maintains a rural character with numerous farms and open space. Tiverton is roughly 20 miles away from New Bedford by car, and about 25 miles from Providence. The closest airport is T.F. Green Airport in Warwick, RI, roughly 32 miles away. One highway, Route 24, runs through North Tiverton.

Many of Tiverton's fishing boats were previously found tied along a property known as Manchester's in a sheltered cove just outside Nanaquaket Pond. However, this property was purchased in 2005 for development and fishermen are no longer allowed to tie up here (East Bay Newspapers 2005). Other fishing vessels are found in Tiverton Basin, an area of the Sakonnet River protected on one side by the Sakonnet River Bridge and on the other side by the Old Stone Bridge that serves as the town's harbor. Tiverton has two boat ramps, one at Sapowet Point and one at Fogland, and one boat yard, Standish Boat Yard (NCCVB nd). There is also a herring ladder in the town (Reel-Time 2003).

Involvement in Northeast Fisheries[169]

Commercial

Tiverton has a relatively large lobster fishery, as well as a small niche conch fishery. Tiverton also has a red crab fishery, identified in the Red Crab FMP (NEFMC nd). In 2001, Tiverton had 122-150 lobster boats, 12-15 conch boats, and 16 finfish boats (Hall-Arber et al. 2001). Bridgeport Seafood in Tiverton is both a retail and wholesale operation.

According to landings data, Tiverton has a highly diversified fishery, with landings in almost every category (see Table 1). The most valuable landings by species based on average values for 1997-2006 is the "other" species category, followed by monkfish, and then lobster. The value of most of these species groupings in 2006 was lower than the ten-year average value. The total value of landings in Tiverton increased sharply between the years 1997-1999, declining again in 2003. The number of home ported vessels in Tiverton increased from 12 in 1997 to 17 in 2000, back to 11 in 2006. The number of vessels with owners living in Tiverton declined from a high of 20 in 2000 to 12 in 2006 (see Table 2). Three dealers in Tiverton bought skate in 2007.

Landings by Species

Table 1. Rank Value of Landings for Federally Managed Groups

Species	Rank Value of Average Landings from 1997-2006
Other[170]	1
Monkfish	2
Lobster	3
Summer Flounder, Scup, Black Sea Bass	4
Skate	5
Largemesh Groundfish[171]	6
Red Crab	7
Surf Clams, Ocean Quahog	8
Squid, Mackerel, Butterfish	9
Smallmesh Groundfish[172]	10
Scallop	11
Dogfish	12

169 In reviewing the commercial landings data several factors need to be kept in mind. 1) While both federal and state landings are included, some states provide more detailed data to NMFS than others. For example, shellfish may not be included or data may be reported only by county and not by port. 2) Some communities did not have individual port codes until more recently. Before individual port codes were assigned, landings from those ports were coded at the county level or as an aggregate of two geographically close small ports. Where landings were coded at the county level they cannot be sorted to individual ports for those earlier years, e.g., prior to 2000. 3) Where aggregated codes were used, those aggregate codes may still exist and be in use alongside the new individual codes. Here the landings which are still assigned to the aggregate port code cannot be sorted into the individual ports, so port level data are only those which used the individual port code. 4) Even when individual port codes exist, especially for small ports, landings may be coded at the county level. Here again it is impossible to disaggregate these to a port level, making the port level landings incomplete. 5) In all these cases, the per port data in this profile may under report the total level of landings to the port, though all landings are accounted for in the overall NMFS database.

170 "Other" species includes any species not accounted for in a federally managed group

171 Largemesh groundfish: cod, winter flounder, yellowtail flounder, American plaice, sand-dab flounder, haddock, white hake, redfish, and pollock

172 Smallmesh multi-species: red hake, ocean pout, mixed hake, black whiting, silver hake (whiting)

Species	Rank Value of Average Landings from 1997-2006
Bluefish	13
Tilefish	14
Herring	15

(Note: Only rank value is provided because value information is confidential in ports with fewer than three vessels or fewer than three dealers, or where one dealer predominates in a particular species and would therefore be identifiable.)

Vessels by Year ***173***

Table 2. Federal Vessel Permits Between 1997-2006

Year	# Vessels (home ported)	# Vessels (owner's city)
1997	12	19
1998	12	15
1999	10	15
2000	17	20
2001	16	17
2002	13	13
2003	14	17
2004	13	18
2005	12	16
2006	11	12

(Note: # Vessels home ported = No. of permitted vessels with location as homeport,
 # Vessels (owner's city) = No. of permitted vessels with location as owner residence174)

Recreational

Recreational fishing is a popular activity in Tiverton. The town's Old Stone Bridge fishing pier is the remainder of an old bridge and is a popular spot for fishing from shore, although it was recently closed for safety reasons after a storm damaged the remaining structure (Burdett 2004). Tiverton also has a couple of fishing charters listed (Forte Marketing nd).

Subsistence

Hall-Arber et al. (2001) notes: "Lots of the people who participate in recreational fishing in Tiverton are Cambodian or have other ethnic backgrounds. Some of this "recreational" activity may actually support a fisheries-based subsistence life style." However, no firm data on subsistence fishing in Tiverton have yet been found.

FUTURE

A facility which formerly housed a wholesale and retail company and was used by a number of vessels has been recently purchased with plans to convert the property into an inn, spa, restaurant, and retail outlets, with a

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173 Numbers of vessels by owner's city and homeport are as reported by the permit holder on permit application forms. These may not correspond to the port where a vessel lands or even spends the majority of its time when docked.

174 The Owner-City from the permit files is technically the address at which the owner receives mail concerning their permitted vessels, which could reflect the actual location of residence, the mailing address as distinct from residence, owner business location, or the address at which a subsidiary receives mail about the permits.

charter fishing company present here as well (East Bay Newspapers 2005). A number of new slips are proposed for a marina in Tiverton. There are also controversial plans to bring LNG tankers into neighboring Fall River, passing by Tiverton, and to develop large-scale retail facilities in the town.

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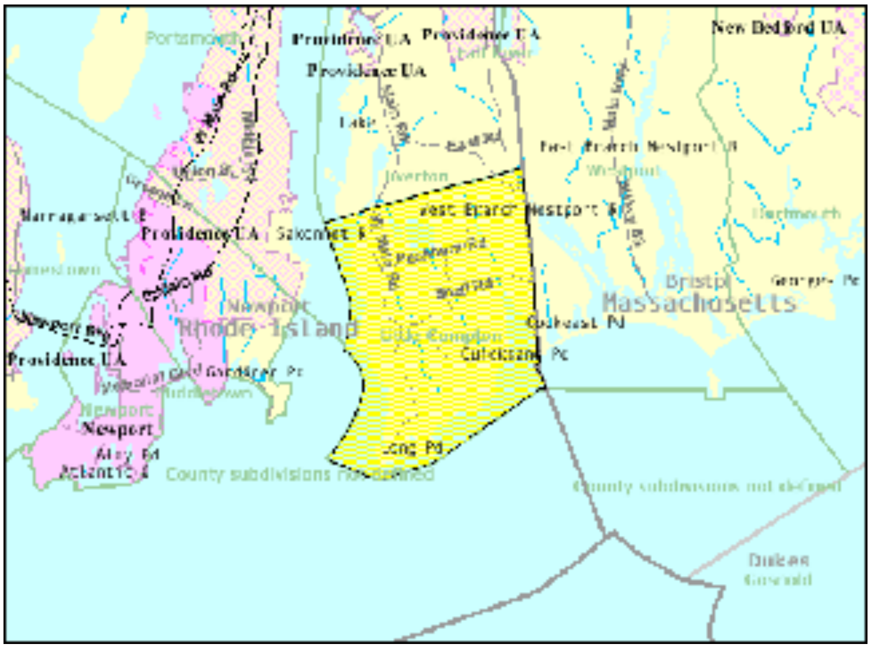
j. LITTLE COMPTON, RI[175]

Community Profile[176]

People and Places

Regional orientation

The Town of Little Compton (41.51º N, 71.17º W) is located in Southeastern Rhode Island in Newport County, along the Massachusetts border. It borders Tiverton and Westport, MA, and is located along the Sakonnet River, part of Narragansett Bay (USGS 2008).



Map 1. Location of Little Compton, RI (US Census Bureau 2000)

Historical/Background

Little Compton was originally home to the Sakonnet or "Segonet" Indians, a Wampanoag tribe led by Awashonks, the sister of King Philip. The original English settlers here were part of Plymouth Colony seeking to expand their land holdings; there were thirty-two original "owners" of the land that is now Little Compton. Among them was Colonel Benjamin Church, who would become famous for his role in the King Philip Indian Wars of the late 17th century. Little Compton was incorporated in 1682 as part of Plymouth Colony, and was later annexed to Newport County as part of Rhode Island together with Tiverton in 1746. Little Compton was raided by the British several times during the Revolutionary War, who met with much resistance from settlers(RIEDC nd). The Sakonnet Point Lighthouse was completed in 1884 and was relit in 1997 after 43 years out of commission (D'Entremont

175 These community profiles have been created to serve as port descriptions in Environmental Impact Statements (EISs) for fisheries management actions. They also provide baseline information from which to begin research for Social Impact Assessments (SIAs). Further, they provide information relevant to general community impacts for National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and information on minorities and low income populations for Executive Order (E.O.) 12898 on Environmental Justice.
176 For purposes of citation please use the following template: "Community Profile of *Town, ST*. Prepared under the auspices of the National Marine Fisheries Service, Northeast Fisheries Science Center. For further information contact Lisa.L.Colburn@noaa.gov."

2007). “Today, Little Compton is a rural-farming community. It was in Little Compton that the famous Rhode Island Red, (a breed of fowl and the State Bird), was developed. Fishing is still a major industry in the town, as one can observe with the daily departure of the fishing fleet from the Sakonnet Wharf. The town has also developed into an ideal vacation spot with the traditional atmosphere of colonial New England” (RIEDC nd). It is also home to what is debatably the oldest continuously operating store in the country, Gray’s Store (RIEDC nd). Sakonnet Point in Little Compton is the most easterly and isolated fishing port in Rhode Island (Hall-Arber et al. 2001).

*Demographics**177***

According to Census 2000 data178, Little Compton had a total population of 3,593, up 7.6% from the reported population of 3,339 in 1990 (US Census Bureau 1990). Of this 2000 total, 49.3% were males and 50.7% were females. The median age was 43.5 years and 75.7% of the population was 21 years or older while 20.9% was 62 or older.

The most populous age group (Figure 1) for both men and women in the 2000 Census was the 40-49 year old grouping, followed closely by both the 50-59 age group. The age structure shows a dip in population for both men and women in the 20-29 age bracket, indicating an out-migration of young people moving elsewhere for college and/or to seek jobs that is common in many fishing communities.

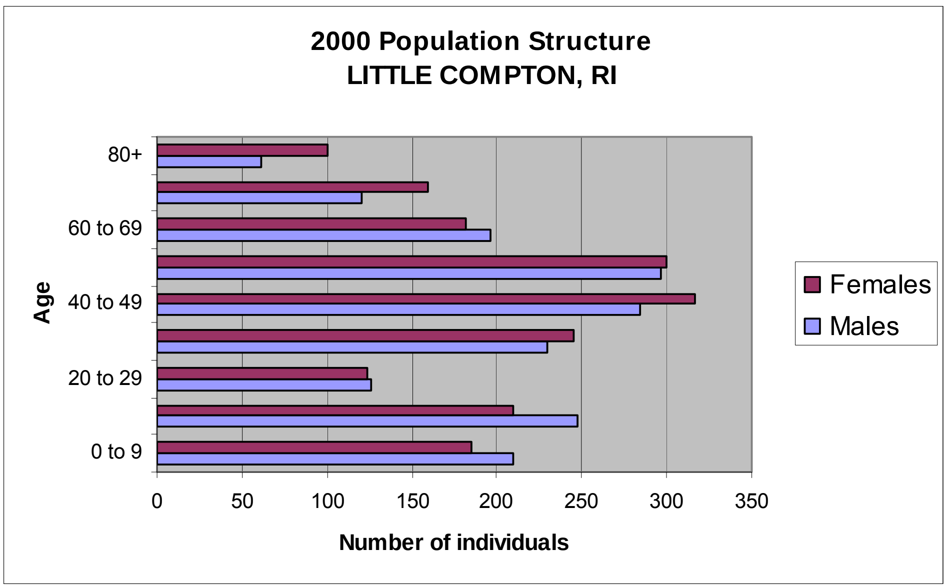


Figure 1. Little Compton’s population structure by sex in 2000 (US Census Bureau 2000)

The majority of the population was White (98.8%), with 0.1% of residents Black or African American, 0.4% Asian, 0.5% Native American, and 0.1% Pacific Islander or Hawaiian (Figure 2). Only 0.9% of the total population identified themselves as Hispanic/Latino (Figure 3). Residents linked their backgrounds to a number of different ancestries including: English (27.6%), Irish (24.5%), Portuguese (14.8%), and French (9.3%). With regard to region of birth, 33.7% were born in Rhode Island, 61.9% were born in a different state and 3.7% were born outside of the U.S. (including 1.1% who were not United States citizens).

177 While mid-term estimates are available for some larger communities, data from the 2000 Census are the only data universally available for the communities being profiled in the Northeast. Thus for cross-comparability we have used 2000 data even though these data may have changed significantly since 2000 for at least some communities.
178 These and all census data, unless otherwise referenced, can be found at U.S. Census: American Factfinder 2000 http://factfinder.census.gov/home/saff/main.html; census data used are for Little Compton town (cited Jul 2007)

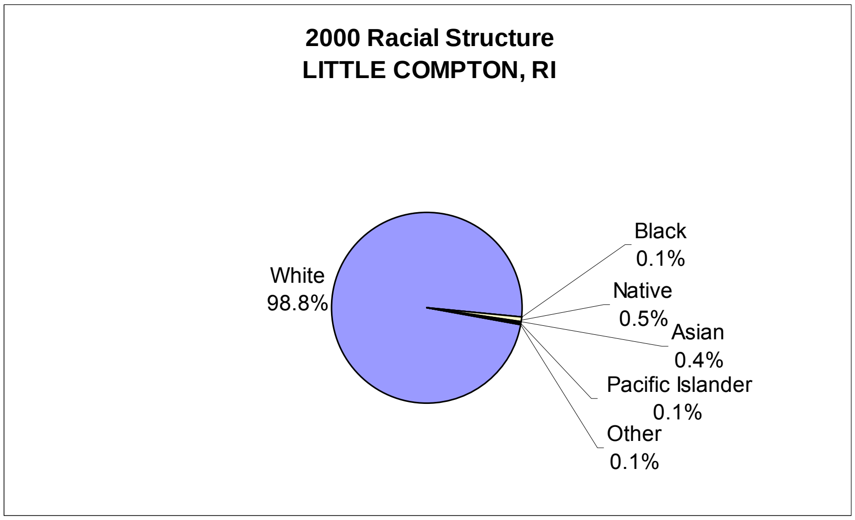


Figure 2. Racial Structure in 2000 (US Census Bureau 2000)

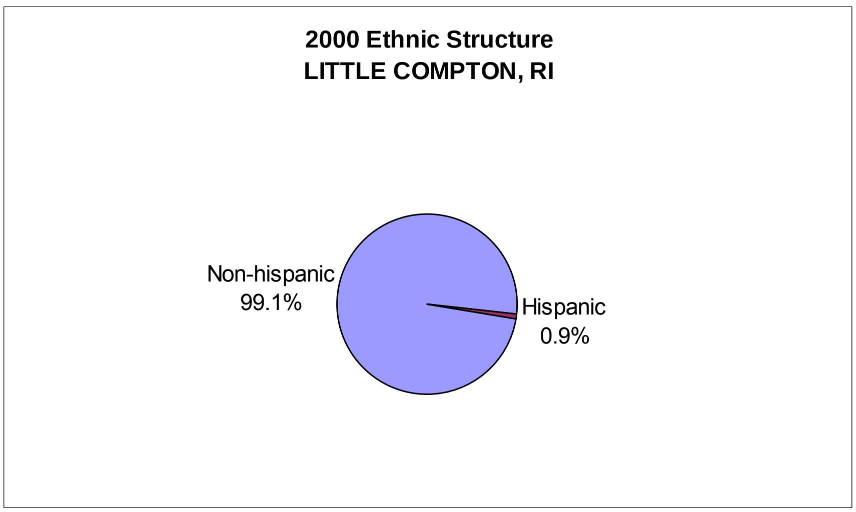


Figure 3. Ethnic Structure in 2000 (US Census Bureau 2000)

For 94.4% of the population, only English was spoken in the home, leaving 5.6% in homes where a language other than English was spoken, and including 1.6% of the population who spoke English less than 'very well' according to the 2000 Census.

Of the population 25 years and over, 91.0% were high school graduates or higher; 45.0% had a bachelor’s degree or higher. Again of the population 25 years and over, 3.8% did not reach ninth grade, 5.2% attended some high school but did not graduate, 22.1% completed high school, 15.3% had some college with no degree, 8.6% received an associate’s degree, 25.8% earned their bachelor’s degree, and 19.2% received either a graduate or professional degree.

Although religion percentages are not available through U.S. Census data, according to the Association of Religion Data Archives in 2000, the religion with the highest number of congregations in Newport County was Catholic with 13 congregations and 68,668 adherents. Other prominent congregations in the county were Episcopal (10 with 4,720 adherents), and American Baptist (15 with 3,022 adherents). The total number of adherents to any religion was up 57.3% from 1990 (ARDA 2000).

Issues/Processes

The Sakonnet Point Club is a group of families and individuals who are currently building a clubhouse at

Sakonnet Point next to the fishing dock, in place of a dilapidated former restaurant. The club will be used to store recreational boats and will include a restaurant and exercise facility. This plan has been controversial because of concerns it will exclude some of the community from this area of waterfront access. This is the one sign of gentrification in Little Compton (Hall-Arber et al. 2001). One house in Little Compton recently sold for $4.4 million, breaking a record, demonstrating the escalating cost of buying a home here (Dunn 2006).

Local lobstermen are concerned about new rules requiring sinking line on lobster traps to protect whales; one commented that making the switch to sinking line from floating line, which most lobstermen use currently, will be costly, and sinking line is more likely to become chafed.179

iv.Cultural attributes

Little Compton holds an annual Fourth of July celebration as well as an annual antique show and chicken barbecue each August.

s. Infrastructure

i.Current Economy

According to the U.S. Census 2000180, 63.4% (1,877 individuals) of the total population 16 years of age and over were in the labor force (Figure 4), of which 2.0% were unemployed, none were in the Armed Forces, and 63.4% were employed.

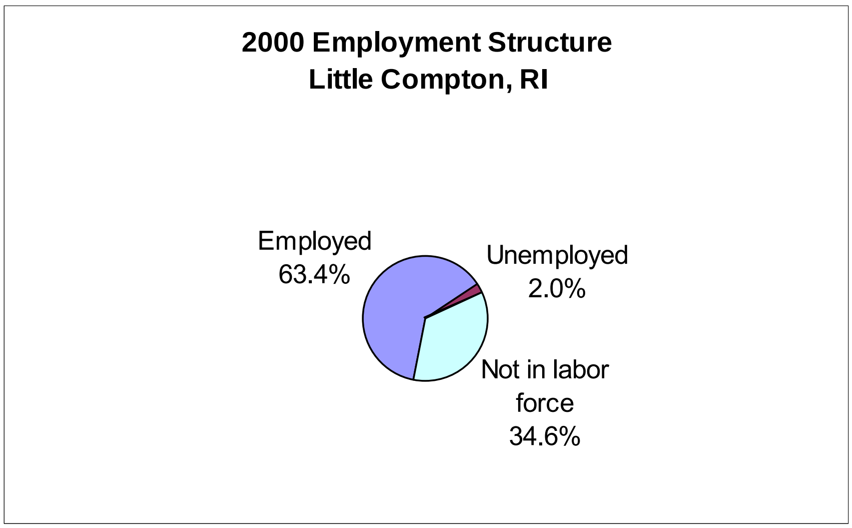


Figure 47. Employment Structure in 2000 (US Census Bureau 2000)

According to Census 2000 data, jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 39 positions or 2.1% of all jobs. Self employed workers, a category where fishermen might be found, accounted for 190 positions or 10.4% of jobs. Education, health, and social services (27.4%), professional, scientific, management, administrative, and waste management services (10.9%), and manufacturing (10.8%) were the primary industries.

Median household income in Little Compton was $55,368 (up 34.4% from $41,187 in 1990 [US Census Bureau 1990]) and per capita income was $32,513. For full-time year round workers, males made approximately 50.6% more per year than females.

The average family in Little Compton consisted of 2.92 persons. With respect to poverty, 3.7% of families (up from 2.1% in 1990 [US Census Bureau 1990]) and 3.4% of individuals earn below the official U.S. Census

179 Profile review comment, Gary Mataronas, Sakonnet Lobstermen's Association, September 6, 2007

180 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families, depending on number of persons (2-9) (US Census Bureau 2000b). In 2000, 17.3% of all families (of any size) earned less than $35,000 per year.

In 2000, Little Compton had a total of 2,103 housing units of which 70.1% were occupied and 92.6% were detached one unit homes. More than one quarter (25.5%) of these homes were built before 1940. Mobile homes accounted for 3.4% of housing units; 83.4% of detached units have between 2 and 9 rooms. In 2000, the median cost for a home in this area was $228,200. Of vacant housing units, 27.9% were used for seasonal, recreational, or occasional use. Of occupied units 19.4% were renter occupied.

Government

Little Compton has a five member Town Council headed by the council President (RIEDC nd).

ii. Fishery involvement in government

David Borden, a Little Compton resident and the Former Director of Natural Resources of the Rhode Island DEM, was named chair of the New England Fishery Management Council in 2003 (RIDEM 2003). There is a Harbormaster in Little Compton.

iii. Institutional

iv. Fishing associations

The Sakonnet Point Fishermen's Association is made up of local fishermen, mostly combination lobstermen and gillnetters, who fish out of Sakonnet Point (Hall-Arber et al. 2001). Some of Little Compton's fishermen also sit on the board of the Rhode Island Lobstermen's Association.

The Rhode Island Saltwater Anglers' Association is dedicated to conservation of the marine environment and of fisheries, and to protecting the rights of saltwater recreational fishermen in Rhode Island. Rhode Island has several other fishery associations to which fishermen in Little Compton might belong, including: the Ocean State Fishermen's Association, the Rhode Island Shellfishermen's Association, the Rhode Island Inshore Fishermen's Association, and the Rhode Island Commercial Fishermen's Association (RIMRU 2002).

Fishing assistance centers

Information on fishery assistance centers in Little Compton is unavailable through secondary data collection.

Other fishing-related institutions

Save the Bay is a non-profit organization dedicated to restoring and protecting the environmental quality of Narragansett Bay. The organization works towards this goal by monitoring the health of the Bay, initiating action to clean up the Bay, and through advocacy and education programs. The Sakonnet Point Club is a group of families and individuals wishing to revitalize Sakonnet Point by building a clubhouse for its members. The club would primarily serve recreational fishermen (Hall-Arber et al. 2001). The Sakonnet Harbor Conservancy is another group which formed in opposition to the club (Editorial 2004).

The Commercial Fisheries Center of Rhode Island was founded in 2004 and is home to nonprofit commercial fishing organizations, and serves "as a headquarters for bringing fishermen, scientists, managers, and elected officials together to discuss issues." The goals of the center are "to improve fisheries and understanding of the marine environment through education, collaborative research, and cooperation."

Physical

Little Compton is roughly 18 miles from Fall River, 20 miles from New Bedford, and 35 miles from Providence. The closest airport is T.F. Green Airport in Warwick, RI, roughly 42 miles away (MapQuest nd). There is no public transportation to Little Compton, and only one sizable road, Route 77, leading into Little Compton, making the town relatively isolated.

The fishing industry in Little Compton is based at Sakonnet Point, at the southern end of the town. There is a small harbor here with a boat ramp and fishing wharf. Sakonnet Lobster is a lobster wholesaler located in Little Compton at Sakonnet Point. Point Trap Company is another lobster company, located on the town dock.181 Sakonnet Point Fish Trap Companies include; Tallman and Mack; Point Trap, HN Wilcox, and Seal Rock.182 There is virtually nothing else at Sakonnet Point other than the fishing operation (Hall-Arber et al. 2001). Sakonnet Oyster Company is an oyster aquaculture company, growing oysters in the Sakonnet River off Little Compton (USDHHS 2005).

t. INVOLVEMENT IN NORTHEAST FISHERIES183

Commercial

The Parascandola Fish Company in Newport operates a system of fish traps at the mouth of the Sakonnet River from May through October. The permits and sites for the traps date back to colonial times. Sakonnet Lobster is a lobster company at Sakonnet Point which sells lobsters locally, regionally, and internationally. A total of 6 federally licensed dealers bought skate in Little Compton in 2007. The fishing industry here is relatively stable between these two operations. Most fishermen in Little Compton are a combination of lobster-gillnet fishermen (Hall-Arber et al. 2001).

Little Compton has a highly diverse fishery. The most valuable species grouping landed in Little Compton in 2006 was summer flounder, scup, and black sea bass, worth $733,407, followed by lobster ($571,640), and monkfish ($519,116). The value of the summer flounder, scup, and black sea bass category was higher in 2006 than the ten-year average value for 1997-2006, as was the value of lobster (Table 1). Landings in Little Compton were highest in 2005, at just under $2.9 million. Landings were well over $1 million in most years except for 1997, when landings were just under $300,000. Home port data provided combines data for Little Compton and Sakonnet (Table 2), as some vessels out of Sakonnet Harbor are listed under Sakonnet. The number of home ported vessels increased slightly from 1997 to 2006. The value of home port landings jumped to over $1 million in 1998 and 1999, and over $1.5 million in 2000, but fell below $1 million for the years 2000-2005. Landings were over $1 million again in 2006. The number of vessels with owners living in Little Compton also showed an increasing trend from 1997 through 2006.

Landings by Species

Table 1. Dollar Value of Federally Managed Groups of Landings in Little Compton, RI

	Average from 1997-2006	2006 only
Monkfish	635,661	519,116

181 Profile review comment, Mike Massa, Harbormaster, September 11, 2007

182 Community Review Comments, Walter Anousian, NMFS Port Agents, January 31, 2008

183 In reviewing the commercial landings data several factors need to be kept in mind. 1) While both federal and state landings are included, some states provide more detailed data to NMFS than others. For example, shellfish may not be included or data may be reported only by county and not by port. 2) Some communities did not have individual port codes until more recently. Before individual port codes were assigned, landings from those ports were coded at the county level or as an aggregate of two geographically close small ports. Where landings were coded at the county level they cannot be sorted to individual ports for those earlier years, e.g., prior to 2000. 3) Where aggregated codes were used, those aggregate codes may still exist and be in use alongside the new individual codes. Here the landings which are still assigned to the aggregate port code cannot be sorted into the individual ports, so port level data are only those which used the individual port code. 4) Even when individual port codes exist, especially for small ports, landings may be coded at the county level. Here again it is impossible to disaggregate these to a port level, making the port level landings incomplete. 5) In all these cases, the per port data in this profile may under report the total level of landings to the port, though all landings are accounted for in the overall NMFS database.

	Average from 1997-2006	2006 only
Summer Flounder, Scup, Black Sea Bass	618,604	733,407
Lobster	295,979	571,640
Other184	138,283	143,217
Squid, Mackerel, Butterfish	103,537	159,304
Largemesh Groundfish185	70,815	173,306
Skate	50,849	68,925
Bluefish	23,736	18,889
Dogfish	17,029	45,765
Herring	1,412	14,000
Smallmesh Groundfish186	457	919
Scallop	289	2,887
Salmon	3	0
Tilefish	3	0

*Vessels by Year**187***

Table 2. All columns represent vessel permits or landings value combined between 1997-2006 for Little Compton and Sakonnet

Year	# Vessels (home ported)	# vessels (owner's city)	Level of fishing home port ($)	Level of fishing landed port ($)
1997	14	13	411,274	272,099
1998	19	17	1,094,677	1,598,820
1999	16	14	1,048,972	1,853,959
2000	14	12	1,578,341	2,678,285
2001	14	12	835,704	1,619,088
2002	13	13	971,428	2,170,451
2003	14	14	764,211	2,170,451
2004	16	16	659,019	2,179,372
2005	18	18	925,276	2,863,485
2006	20	21	1,177,839	2,451,375

(Note: # Vessels home ported = No. of permitted vessels with location as homeport
 # Vessels (owner's city) = No. of permitted vessels with location as owner residence188
Level of fishing home port ($) = Landed value of fisheries associated with home ported vessels

184 "Other" species includes any species not accounted for in a federally managed group

185 Largemesh Groundfish: cod, winter flounder, yellowtail flounder, American plaice, sand-dab flounder, haddock, white hake, redfish, and pollock

186 Smallmesh Multi-Species: red hake, ocean pout, mixed hake, black whiting, silver hake (whiting)

187 Numbers of vessels by owner's city and homeport are as reported by the permit holder on permit application forms. These may not correspond to the port where a vessel lands or even spends the majority of its time when docked.

188 The Owner-City from the permit files is technically the address at which the owner receives mail concerning their permitted vessels, which could reflect the actual location of residence, the mailing address as distinct from residence, owner business location, or the address at which a subsidiary receives mail about the permits.

Level of fishing landed port ($) = Landed value of fisheries landed in location)

Recreational

There are three fishing charters listed for Little Compton: Captain David Cornell Fishing Charters, Captain Bud Phillips Fishing Charters, and Island Charters. They fish for tuna, shark, bass, and bluefish (Forte Marketing nd).

Subsistence

Information on subsistence fishing in Little Compton is either unavailable through secondary data collection or the practice does not exist.

u. Future

The community is generally focused on keeping development down in the town, and with the exception of the clubhouse at Sakonnet Point which is being built, there are no major changes planned for the community (Hall-Arber et al. 2001).

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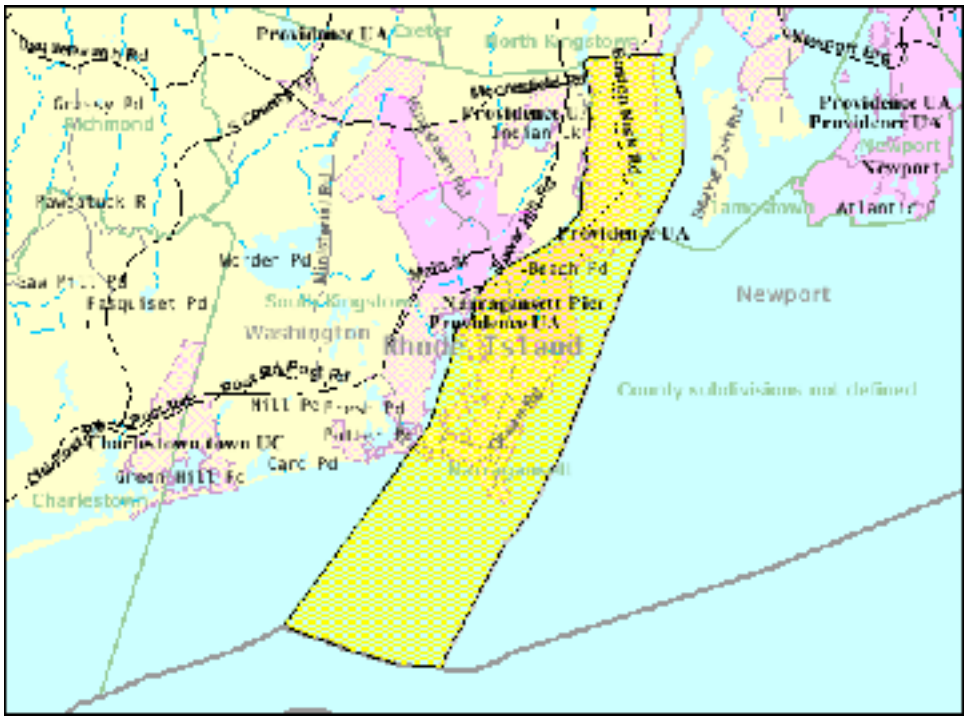
k. POINT JUDITH/NARRAGANSETT, RI[189]

Community Profile[190]

People and Places

Regional orientation

Narragansett (41.45°N, 71.45°W) (USGS 2008) is located in Washington County, 30 miles south of Providence. Point Judith is located in the southern end of Narragansett along Highway 108 near Galilee State Beach, at the western side of the mouth of Rhode Island Sound. Point Judith itself is not a CDP or incorporated town, and as such has no census data associated with it. Thus, this profile provides census data from Narragansett Town (town-wide) and other data from both Point Judith itself and Narragansett. According to the state of Rhode Island both Point Judith and Galilee are considered villages within the town of Narragansett (State of Rhode Island 2008).



Map 1. Location of Narragansett, RI (US Census Bureau 200a)

Historical/Background

The land now called Narragansett was originally inhabited by the Narragansett Indians until Roland Robinson purchased it in 1675 (Town of Narragansett nd). Over the next half-century, the Rhode Island, Connecticut and Massachusetts colonies all vied for control of Narragansett until the British crown placed the area

189 These community profiles have been created to serve as port descriptions in Environmental Impact Statements (EISs) for fisheries management actions. They also provide baseline information from which to begin research for Social Impact Assessments (SIAs). Further, they provide information relevant to general community impacts for National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and information on minorities and low income populations for Executive Order (E.O.) 12898 on Environmental Justice.

190 For purposes of citation please use the following template: "Community Profile of *Town, ST*. Prepared under the auspices of the National Marine Fisheries Service, Northeast Fisheries Science Center. For further information contact Lisa.L.Colburn@noaa.gov."

under the control of Rhode Island (State of Rhode Island 2008). By the 1660s, settlers put the fertile soil to use by developing agriculture in the area. Soon the area's economy depended on the export of agricultural products to markets such as Boston, Providence, and Newport. At this time, Point Judith was connected to the sea by a deep, wide breachway, which was used to ship the agricultural goods to market. By the 1700s there was a thriving ship building industry and a busy port. In the early 1800's Narragansett, like the rest of the country experienced rapid industrial growth, particularly in the textile industry. By the mid 1800's the resort tourism industry developed in Narragansett including the once popular Narragansett Casino. The Narragansett Casino was destroyed by fire on September 12, 1900; most of the remaining tourism resorts were destroyed by fire in the early 1900s (Narragansett nd; Encyclopaedia Britannica 2008). Fishing did not come into prominence again until the 1930s (Griffith and Dyer 1996)

By the 1800s many farmers began to supplement their income by fishing for bass and alewife, or harvesting oysters. Eventually, the Port of Galilee was established in the mid 1800's as a small fishing village. By the early 1900's Point Judith's Port of Galilee became one of the largest fishing ports on the east coast. This was largely due to a series of construction projects that included dredging the present breachway and stabilizing it with stone jetties and the construction of three miles of breakwater that provided refuge from the full force of the ocean. By the 1930's wharves were constructed to facilitate large ocean-going fishing vessels (Eckilson 2007). At this point the port became important to the entire region's economy (Griffith and Dyer 1996). Today, Point Judith is not only an active commercial fishing port, but it supports a thriving tourism industry that includes restaurants, shops, whale watching, recreational fishing, and a ferry to Block Island. Point Judith sits on a knob of land that extends out into the open Atlantic Ocean, making it a popular spot for surfing if the ocean swell is angled properly to produce a breaking wave near the seawall.

Demographics[191]

No Census data are available for Point Judith itself, but they are available for the county subdivision Narragansett Town which includes Point Judith. As Point Judith is not actually a residential area, and those who fish from Point Judith live in surrounding communities, this is more representative of the "fishing community" than would be any data on Point Judith alone. However, it should be noted that fishermen fishing out of Point Judith are likely to live all over Rhode Island.

According to Census 2000 data, Narragansett had a total population of 16,361, up 9.2% from a reported population of 14,985 in 1990 (US Census Bureau 1990). Of this 2000 total, 48.6% were males and 51.4% were females. The median age was 36.4 years and 76.2% of the population was 21 years or older while 16.1% were 62 or older.

The population structure of Narragansett (see Figure 1) had an unusually high percentage of the population in the 20-29 year age group, far outnumbering all other age categories. This is likely due to the presence of nearby University of Rhode Island; many students at the university live in Narragansett. Others may stay in the area for employment after graduation, which would also contribute to the population structure.

191 While mid-term estimates are available for some larger communities, data from the 2000 Census are the only data universally available for the communities being profiled in the Northeast. Thus for cross-comparability we have used 2000 data even though these data may have changed significantly since 2000 for at least some communities.

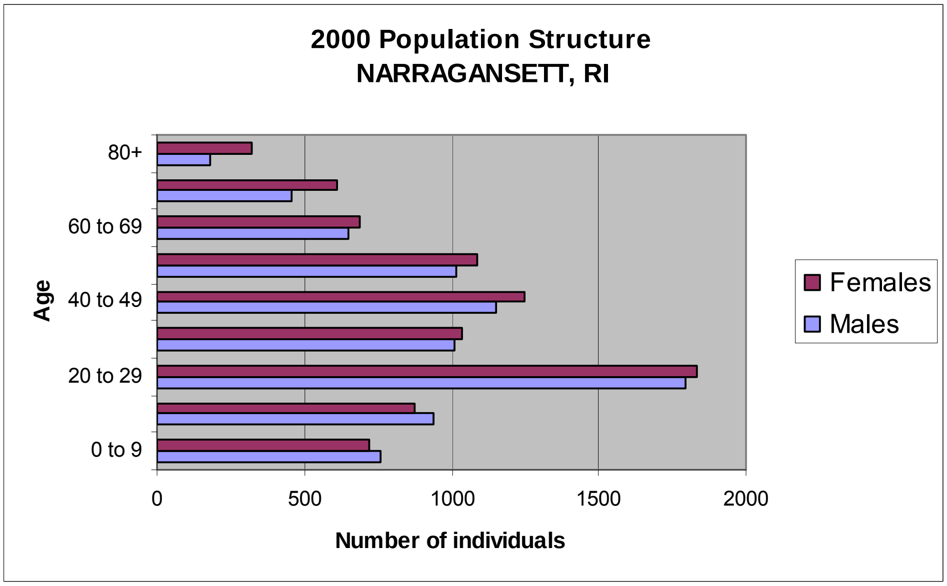


Figure 1. Narragansett's population structure by sex in 2000 (US Census Bureau 2000a)

The majority of the population was white (95.6%), with 1.3% black or African American, 1.0% Asian, 1.4% Native American, and 0.1% Pacific Islander or Hawaiian (see Figure 2). Only 1.2% of the population identified themselves as Hispanic/Latino (see Figure 3). Residents traced their backgrounds to a number of different ancestries including: Irish (31.8%), Italian (20.6%) and English (18.9%) (US Census Bureau 2000a).

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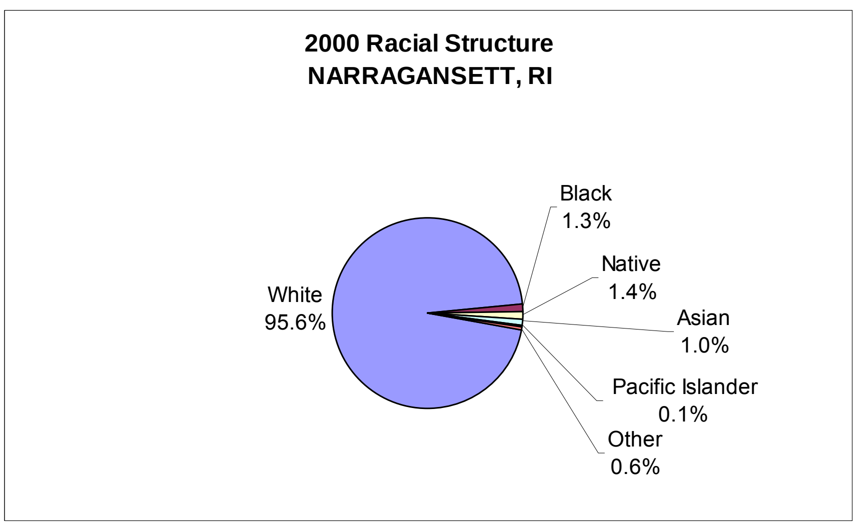

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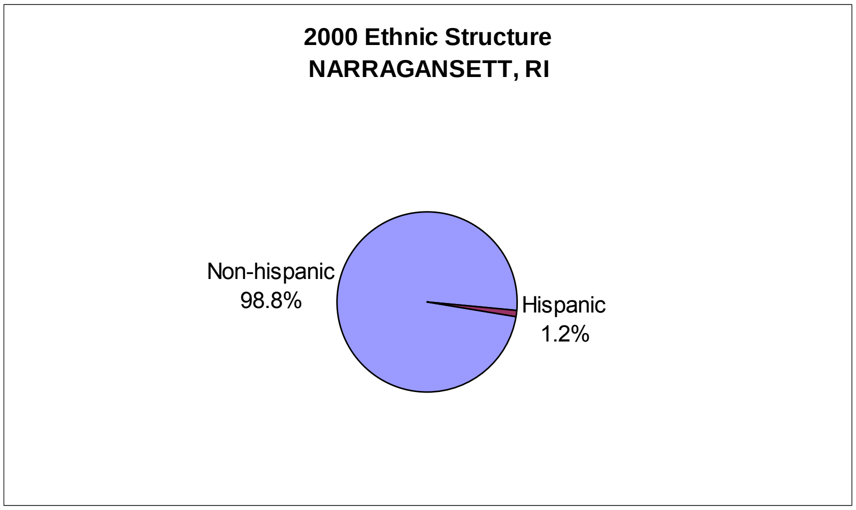

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Although religion percentages are not available through U.S. Census data, according to the Association of Religion Data Archives (ARDA) in 2000, the religion with the highest number of congregations and adherents in Washington County was Catholic with 20 congregations and 58,668 adherents. Other prominent congregations in the county were American Baptist Churches (15 congregations with 3,022 adherents) and Episcopal (10 with 4,720 adherents). The total number of adherents to any religion was up 57.3% from 1990 (ARDA 2000).

Issues/Processes

Not unlike many fishing communities in the Northeast, increasingly stringent state and federal fishing regulations could jeopardize the viability of Point Judith as a fishing port, affecting both commercial and recreational fishermen. In addition to affecting the fishermen directly, Point Judith processing companies have difficulty handling drastic deviations in the number of landings, commonly due to the lifting or expanding of quotas, as well as sudden changes in what species are landed. It is also important to note that Point Judith fishermen harvest both species managed by the New England Fishery Management Council and the Mid-Atlantic Fishery Management Council, which increases the level of management measures they must follow.192

Under Amendment 3 to the Skate FMP a concern is that juvenile Winter skate (defined as overfished) can be mistaken for juvenile Little Skate (which is not overfished). However, both observer data and the owner of The Bait Company, Andrea Incollingo (who was trained to distinguish between the two species by a NMFS staff member when she began her business in 1984), agree that when there are Winter Skate present it is in small amounts – 5-10%193.

Most skate landed in Point Judith is whole skate bait, though some wings and whole skate are also landed. Bait in October of 2008 goes for 10 cents a pound for lobstermen. Wings for food go for 50-70 cents. To go skate fishing you have to be under groundfish (multispecies) Days-at-Sea (DAS), and with those DAS dwindling people

192 Profile review comment, David Beutel, URI Fisheries Center, August 23, 3007

193 Interview with Andrea Incollingo, owner of The Bait Company, October 22, 2008 by Patricia M. Clay of the NMFS Northeast Fisheries Science Center.

don’t want to commit the time for a 10 cent fishery so there is a big impact on lobster fishery. There used to be a number of vessels targeting skate, but now it is mostly some smaller boats bringing in small amounts of bycatch with their groundfish. This is an issue for bait dealers and for lobstermen[194].

Additionally, the boom in tourism at Point Judith has had an adverse effect on the commercial fishing industry. Not only do fishermen battle parking issues but shore front rents for fish processing companies and the cost of dockage and wharfage for vessels have increased (Griffith and Dyer 1996).

Cultural attributes

The Narragansett/ Point Judith community celebrates its maritime history with the annual Blessing of the Fleet (Griffith and Dyer 1996), an event that is sponsored by the Narragansett Lions Club. The festival includes the Blessing of the Fleet Road Race of 10 miles of the surrounding area, a Seafood Festival, and rides at Veteran's Memorial Park that last throughout the last weekend of July. The 2004 Blessing of the Fleet included approximately 20 commercial and 70 recreational vessels and gathered an estimated crowd of 200 to 300 to view the passing. The Fishermen’s Memorial Park is located in Point Judith and features recreational activities and a playground. Each Saturday in the summer months, the park hosts a Farmer’s Market, featuring local produce and often lobsters caught on local vessels. There is a new fishermen’s memorial project underway, to be situated near the Coast Guard light.[195]

Infrastructure

Current Economy

Besides an active fishing port, Point Judith supports a thriving seasonal tourism industry that includes restaurants, shops, whale watching, recreational fishing, and a ferry to Block Island (Griffith and Dyer 1996). It also has a number of fish processing companies that do business locally, nationally, and internationally. Point Judith’s largest fish processors are the Town Dock Company and the Point Judith Fishermen’s Company – a subsidiary of M. Slavin & Sons based in NY.

Town Dock came to Point Judith in 1980 and is now one of the largest seafood processing companies in Rhode Island. Its facility supports unloading, processing, and freezing facilities under one roof and services “over half of the port's boats (approximately 30 full time deep sea fishing trawlers) as well as a large day-boat fleet . . . and handle[s] all the southern New England and Mid-Atlantic species of fish including Squid, Monkfish, Flounder, Whiting, Scup, Butterfish, and Fluke.”

The Point Judith Fishermen’s Company (with approximately 15 employees) unloads boats and processes squid which are then taken by M. Slavin & Sons to sell wholesale at the Fulton Fish Market in NY.[196] Handrigan’s is another unloading facility located here.[197] Several smaller processors are also located in the Point Judith area: Deep Sea Fish of RI, Ocean State Lobster Co., Narragansett Bay Lobster Co., Fox Seafood, South Pier Fish Company, Osprey Seafood, and Sea Fresh America (USFDA 2008). Paiva’s Shellfish has their own lobster dock in Point Judith but in 2003 after some time experimenting with finfish for auction and horseshoe crabs for bait and biomedical purposes, they relocated to Cranston and became a wholesaler.[198,199] Economic history up to 1970 can be found in Poggie and Gersuny (1978).

. There are primarily 2 skate dealers in RI which support lobstermen from western CT to Cape Cod. Point Judith is the biggest RI landing site for skate, with Tiverton second. The Bait Company is a skate bait dealer in Point

194 Interview with Walter Anoushian, NMFS Port Agent based in Point Judith, October 16, 2008, by Patricia M. Clay of the NMFS Northeast Fisheries Science Center.
195 Profile review comment, David Beutel, URI Fisheries Center, August 23, 3007
196 Phone conversation with employee (401-782-1500)
197 Profile review comment, David Beutel, URI Fisheries Center, August 23, 3007
198 Phone call to owner, Stopped processing last year (401-941-3850)
199 Community Review Comments, Walter Anoushian, NMFS Port Agent, January 31, 2008

Judith which buys directly from draggers and sells exclusively to lobstermen. It employs 10 people full-time with an additional 2-3 in the summer, and buys regularly from 5 boats with another 10 occasionally. Each dragger crews 2-4 people. It sells to about 50 inshore lobster boats from RI, CT and southern MA, and 14 offshore 14 lobster vessels – all based in Point Judith. An inshore vessel crews 1-2 people, and an offshore vessel usually 4. The owner says her boats don't go to Georges Bank for bait, just RI and southern MA200.

According to the U.S. Census 2000201, of the total population 16 years of age and over, 67.0% were in the labor force (see Figure 4), of which 2.2% were unemployed, 0.2% were in the Armed Forces, and 64.6% were employed.

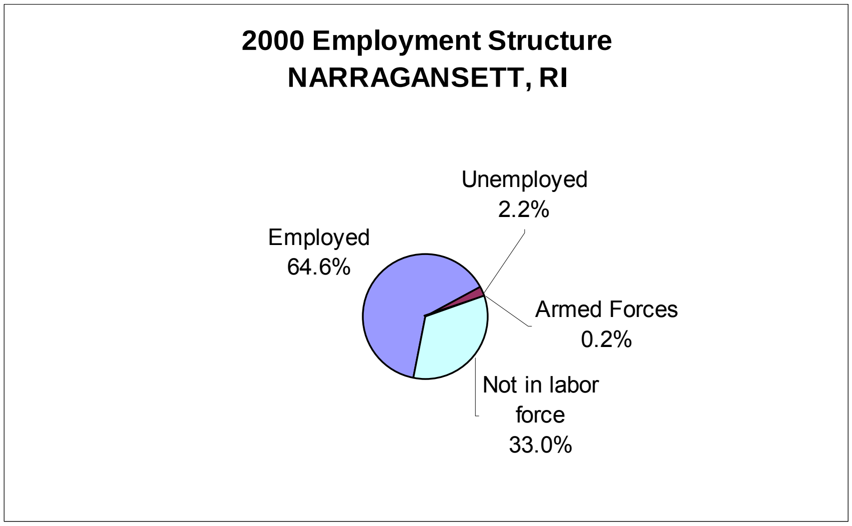

Figure 4. Employment structure in 2000 (US Census Bureau 2000a)

According to Census 2000 data, jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 239 positions or 2.7% of all jobs (the majority of which is likely to be fishing based on limited activity in the other categories)202. Self employed workers, a category where fishermen might be found, accounted for 171 positions or 8.6% of jobs. Educational, health and social services (26.0%), arts, entertainment, recreation, accommodation and food services (11.8%), professional, scientific, management, administrative, and waste management services (10.8%), and retail trade (10.4%) were the primary industries.

Median household income in Narragansett was $50,363, up 41.7% from $35,545 in 1990 (US Census Bureau 1990) and median per capita income was $28,194. For full-time year round workers, males made approximately 43.1% more per year than females.

The average family in Narragansett consisted of 2.86 persons. With respect to poverty, 4.9% of families, up from 2.9% in 1990 (US Census Bureau 1990) and 16.0% of individuals earned below the official U.S. Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families, depending on number of persons (2-9) (US Census Bureau 2000b). In 2000, 21.8% of all families (of any size) earned less than $35,000 per year.

In 2000, Narragansett had a total of 9,159 housing units, of which 74.7% were occupied and 79.4% were detached one unit homes. Less than one tenth (9.8%) of these homes were built before 1940. Mobile homes, boats, RVs, vans, etc. accounted for 0.9% of the housing units; 90.3% of detached units have between 2 and 9 rooms. In 2000, the median cost for a home in this area was $163,500. Of vacant housing units, 88.0% were used for seasonal, recreational, or occasional use. Of occupied units, 38.1% were renter occupied.

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200 Interview with Andrea Incollingo, owner of The Bait Company, October 22, 2008 by Patricia M. Clay of the NMFS Northeast Fisheries Science Center.

201 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

202 Profile review comment, Michael DeLuca, Town of Narragansett, Department of Community Development, December 18, 2007

Government

Narragansett's form of government is a town manager and a five-member town council, headed by a council president. Narragansett was established in 1888 and incorporated in 1901 (State of Rhode Island nd).

Fishery involvement in government

Narragansett has a town Harbor Management Commission and a designated Harbormaster. Narragansett has a town Harbor Management Commission, appointed by the Town Council (HMC nd). The Harbor Management Commission meets once each month to address issues related to management of the town's waters, particularly Point Judith Pond and the Narrow River. Galilee has special zoning which designates certain areas for fishing-related uses only.203 NOAA Fisheries Statistics Office also has a port agent based here. Port agents sample fish landings and provide a 'finger-on-the-pulse' of their respective fishing communities (NERO FOS 2008). NOAA Northeast Fisheries Science Center's Narragansett Laboratory is located on the Bay Campus of the University of Rhode Island (URI). "It is adjacent to URI's Graduate School of Oceanography and the National Health and Environmental Effects Research Laboratory of the Environmental Protection Agency (EPA). The facility consists of one main building and aquarium, and four adjacent office/laboratory modular buildings. The laboratory is a facility with a specialized staff of 50 supported by advanced oceanographic and biological systems for carrying out research on the effects of changing environmental conditions on the growth and survival of fish stocks from an ecosystems perspective" (NEFSC nd). Rhode Island Sea Grant is also located at URI's Narragansett Bay Campus. The RI Department of Environmental Management Division of Enforcement has a small office in Point Judith.204

Institutional

Fishing associations

Point Judith Fishermen's Cooperative went defunct in 1994 as the victim of declining stocks205, and is now run as an independent fish marketing organization.206 Rhode Island Seafood Council, a now-defunct not-for-profit organization established in 1976, was located here and promoted quality seafood products. The American Seafood Institute was established in 1982 in conjunction with the Rhode Island Seafood Council and provides assistance to the fishing industry in exporting product overseas (Hall-Arber et al. 2001). The Point Club is a self-insurance group for fishermen to protect against price gouging, etc.207 The Rhode Island Commercial Fishermen's Association has members throughout Point Judith and the state. The organization is based at the Commercial Fisheries Center at East Farm on the University of Rhode Island's main campus. The Rhode Island Lobstermen's Association and the Rhode Island Fishermen's Alliance are well represented in Point Judith, and the RI Shellfishermen's Association is likely to also have members fishing from here.208 The Rhode Island Lobstermen's Association has approximately 80-100 fishermen and some infrastructure (people trap dealers, bait dealers, etc.)209.

Fishing assistance centers

The Bay Company was developed under the Rhode Island Marine Trade Education Initiative and attempts to link academia to the marine industry to improve productivity and economic viability; it is now defunct since the funding disappeared in 2003 (Hall-Arber et al. 2001).

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203 Profile review comment, Michael DeLuca, Town of Narragansett, Department of Community Development, December 18, 2007
204 Profile review comment, David Beutel, URI Fisheries Center, August 23, 3007
205 Profile review comment, Chris Brown, Rhode Island Commercial Fishermen's Association, October 19, 2007
206 Personal communication, Dr. Madeleine Hall-Arber, MIT Sea Grant.
207 Profile review comment, Chris Brown, Rhode Island Commercial Fishermen's Association, October 19, 2007
208 Profile review comment, David Beutel, URI Fisheries Center, August 23, 3007
209 Interview with Lanny Dellinger, Pres. Of the RI Lobstermen's Association, October 23, 2008 by patricia M. Clay of the NMFS Northeast Fisheries Science Center.

Other fishing related organizations

The Commercial Fisheries Center of Rhode Island was founded in 2004 and is home to nonprofit commercial fishing organizations, and serves "as a headquarters for bringing fishermen, scientists, managers, and elected officials together to discuss issues." The goals of the center are "to improve fisheries and understanding of the marine environment through education, collaborative research, and cooperation" (CFCRI nd).

Physical

Point Judith is about 22 miles from Newport, 36 miles from Providence, and 52 miles from New Bedford. TF Green Airport in Warwick, RI is about 25 miles from Point Judith, and Westerly State Airport, a smaller airport, is 17 miles away. A ferry runs from Block Island to Point Judith. From Block Island it is possible to take another ferry to Montauk, NY (BICC 2007; RIPTA nd; State of Rhode Island nd). The Rhode Island Public Transportation Association (RIPTA) runs a bus to Galilee. Buses to other New England destinations are available at T.F. Green airport and from Newport and Providence (RIPTA nd; State of Rhode Island nd). Point Judith also boasts a lighthouse that doubles as a popular surfing spot.

Great Island Road at Point Judith has several docking facilities for both commercial and charter vessels (DEM 2005a). There is a marine supply store where most fishermen shop, and a commercial bait store serving the local trap fishermen. In addition to the dockside infrastructure, there are seasonal restaurants along the main street area and tourism predominately from the ferry crowds the streets and often frustrates residents in the summer.210 The Point Judith Fishermen's Company unloads boats and processes squid which are then taken by M. Slavin & Sons to sell wholesale at the Fulton Fish Market in NY.211 Handrigan's is another unloading facility located here.212 Several smaller processors are also located in the Point Judith area: Deep Sea Fish of RI, Ocean State Lobster Co., MC Fresh Inc., Narragansett Bay Lobster Co., Inc., Fox Seafood, South Pier Fish Company, Osprey Seafood, and Sea Fresh America (USFDA 2008). In 2003 Paiva's Shellfish quit the fillet business and relocated to Cranston as a wholesaler.213 Trawlworks, Inc. in Narragansett is a supplier and distributor of marine hardware and rigging supplies for industrial, institutional, and commercial fishing for both mid-water and bottom use. The corporation was formed in 1980. Superior Trawl is also located in Narragansett, and builds fishing gear sold throughout New England and the Mid-Atlantic. Wilcox Marine Supply, located in Point Judith, supplies vessels, and The Bait Company sells bait to local lobstermen.214 Point Judith Marina has been designated as a "Clean Marina" by the State of RI (CMRC 2008).

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210 Pers. Comm. Point Judith resident, 06/29/2007
211 Phone conversation with employee (401-782-1500)
212 Profile review comment, David Beutel, URI Fisheries Center, August 23, 3007
213 Phone call to owner, Stopped processing last year (401-941-3850)
214 Profile review comment, David Beutel, URI Fisheries Center, August 23, 3007

Involvement in Northeast Fisheries215

Commercial

According to the RI Department of Environmental Management, the number of commercial vessels in port in Galilee (Point Judith) 2004 was 230 (RIDEM 2004). Vessels ranged from 45-99 feet, with most being groundfish trawlers. Of these, 55 were between 45 and 75 feet, and 17 over 75 feet (Hall-Arber et al. 2001). In 2004, Point Judith was ranked 24th in value of landings by port in the U.S. (sixth on the East Coast) (FUS 2007). Point Judith had 15 dealers buying skate in 2007, placing it the top three ports in the Northeast for number of skate dealers.

The state's marine fisheries are divided into three major sectors: shellfish, lobster, and finfish. The shellfish sector includes oysters, soft shell clams, and most importantly, quahogs. The lobster sector is primarily comprised of the highly valued American lobster with some crabs as well. The finfish sector targets a variety of species including winter, yellowtail and summer flounder, tautog, striped bass, black sea bass, scup, bluefish, butterfish, squid, whiting, skate, and dogfish. A wide range of gear including otter trawl nets, floating fish traps, lobster traps, gill nets, fish pots, rod and reel, and clam rakes are used to harvest these species. The state currently issues about 4,500 commercial fishing licenses (Lazar and Lake 2001).

Over the ten year period from 1997-2006, the value of landings in Point Judith varied but seemed to show a declining trend between 1997-2006, from a high of just over $51 million to a low of $31 million in 2002-2003. However, in 2004 the landings value began to increase again, back to just under $47 million in 2006. The landings value for the squid, mackerel, and butterfish species grouping was higher in 2006 than the average value for 1997-2006 (see Table 1). The value of lobster in 2006, second most valuable in terms of landings, was lower in 2006 than the average value for the same time period. Vessel data is combined here for Point Judith and Narragansett; there are no vessel owners listed for Point Judith (because the name refers only to the port), indicating that many fishermen live in the Narragansett area and fish out of Point Judith. In total, the number of vessels home ported in either Point Judith or Narragansett reached a high of 186 in 2001, and a low of 168 in 2006. The number of vessels with owners living in Narragansett was much lower in all years than the number of vessels home ported here, indicating that many of the vessels in Point Judith have owners residing in other communities.

Landings by Species

Table 1. Dollar value of Federally Managed Groups of landings in Point Judith

	Average from 1997-2006	2006 only
Squid, Mackerel, Butterfish	11,298,781	13,188,211
Lobster	11,022,301	8,675,086
Summer Flounder, Scup, Black Sea Bass	4,718,136	6,495,568
Smallmesh Groundfish216	2,816,677	1,799,479

215 In reviewing the commercial landings data several factors need to be kept in mind. 1) While both federal and state landings are included, some states provide more detailed data to NMFS than others. For example, shellfish may not be included or data may be reported only by county and not by port. 2) Some communities did not have individual port codes until more recently. Before individual port codes were assigned, landings from those ports were coded at the county level or as an aggregate of two geographically close small ports. Where landings were coded at the county level they cannot be sorted to individual ports for those earlier years, e.g., prior to 2000. 3) Where aggregated codes were used, those aggregate codes may still exist and be in use alongside the new individual codes. Here the landings which are still assigned to the aggregate port code cannot be sorted into the individual ports, so port level data are only those which used the individual port code. 4) Even when individual port codes exist, especially for small ports, landings may be coded at the county level. Here again it is impossible to disaggregate these to a port level, making the port level landings incomplete. 5) In all these cases, the per port data in this profile may under report the total level of landings to the port, though all landings are accounted for in the overall NMFS database.

216 Smallmesh multi-species: red hake, ocean pout, mixed hake, black whiting, silver hake (whiting)

	Average from 1997-2006	2006 only
Monkfish	2,687,563	2,110,227
Largemesh Groundfish217	2,451,647	3,383,452
Other218	2,056,576	2,697,425
Scallop	1,457,702	7,420,396
Skate	618,033	604,990
Herring	470,065	376,506
Tilefish	230,142	32,985
Bluefish	112,378	118,466
Dogfish	48,031	45,000
Red Crab	9,593	0

Vessels by Year219

Table 2. All columns represent vessel permits or landings value between 1997 and 2006 for Point Judith/Narragansett

Year	# Vessels (home ported)	# Vessels (owner's city)	Level of fishing home port ($)	Level of fishing landed port ($)
1997	181	61	33,021,800	47,529,746
1998	175	55	32,870,223	42,614,251
1999	181	60	36,324,182	51,144,479
2000	184	61	33,911,658	41,399,853
2001	186	62	30,121,535	33,550,542
2002	179	53	30,014,709	31,341,472
2003	173	52	32,793,425	31,171,867
2004	174	51	37,058,022	36,016,307
2005	171	52	37,150,241	38,259,922
2006	168	51	41,021,147	46,947,791

(Note: # Vessels home ported = No. of permitted vessels with location as homeport
 # Vessels (owner's city) = No. of permitted vessels with location as owner residence220
Level of fishing home port ($) = Landed value of fisheries associated with home ported vessels
Level of fishing landed port ($) = Landed value of fisheries landed in location)

Recreational

Rhode Island marine waters also support a sizable recreational fishing sector. "In Rhode Island, nearly 362,000 recreational marine anglers - more than half from out-of-state - made over 1.5 million trips, catching 4.3 million pounds of sport fish and releasing about 55 percent in 2004" (RIDEM 2004). This indicates that the recreational component is significant both in terms of the associated revenues generated (support industries) and

217 Largemesh groundfish: cod, winter flounder, yellowtail flounder, American plaice, sand-dab flounder, haddock, white hake, redfish, and pollock
218 "Other" species includes any species not accounted for in a federally managed group
219 Numbers of vessels by owner's city and homeport are as reported by the permit holder on permit application forms. These may not correspond to the port where a vessel lands or even spends the majority of its time when docked.
220 The Owner-City from the permit files is technically the address at which the owner receives mail concerning their permitted vessels, which could reflect the actual location of residence, the mailing address as distinct from residence, owner business location, or the address at which a subsidiary receives mail about the permits.

harvesting capacity. Between 2001- 2005, there were 66 charter and party vessels making 7,709 total trips registered in logbook data by charter and party vessels in Point Judith carrying a total of 96,383 anglers (MRFSS data). A 2005 survey by the RI Dept. of Environmental Management showed Point Judith to be the most popular site in the state for shore based recreational fishing (RIDEM 2005). Narragansett has two public saltwater boat ramps (RIDEM 2005a).

Subsistence

Observations by local officials indicate subsistence fishing occurs around Narragansett. Most subsistence fishermen fish at night and in the early morning. No data has been collected on this practice.221

FUTURE

Point Judith fishermen are not very positive about the future of Point Judith as a fishing port. Besides the main concern of stringent fishing regulations Point Judith fishermen also must contend with the ever increasing tourism at the port. This has caused parking issues and rent increases. Recent (2008) national economic conditions have contributed to large increases in vessel fuel and exacerbated already tight financial conditions for vessels and related fisheries businesses.

Oceanlinx Limited (formerly Energetech Australia) is a wave power company working on a pilot project to build and install a wave power plant off Point Judith. Called "Project **GreenWave", the effort** is a non-profit pilot, with funding from Massachusetts, Rhode Island and Connecticut and would become the first wave power installation in the U.S. if successful. As the effort is a first, there has been confusion over whether the regulatory jurisdiction is state or federal, which has slowed the projects commencement. "The station would be located just outside the Point Judith breakwater and about a mile offshore. Care is being taken not to disrupt commercial ship traffic or recreational boaters. The station will be designed to: withstand '100 year storm criteria', be easily towed to port, make 100 times less noise than an outboard motor; and have only one moving part — the turbine." (RD 2007) In addition, the Rhode Island Wind Energy Project has mapped several potential sites for future wind turbine placement offshore; one of the possible sites is just off Point Judith (ATM 2007).

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l. STONINGTON, CT[222]

Community Profile[223]

People and Places

Regional orientation

The city of Stonington, Connecticut (41.20°N, 71.54°W) is located in New London County (USGS 2008). The town is 16 miles from New London, CT, 48 miles from Providence, RI, and 61 miles from Hartford, CT (MapQuest 2006). Stonington covers 42.7 square miles and includes the villages of Mystic, Old Mystic, Stonington Borough, and Pawcatuck (Sabin 2008).

Map 2. Location of Stonington, CT (US Census Bureau 2000a)

Historical/Background

The town of Stonington, founded in 1649, encompasses several villages: the Borough of Stonington; Pawcatuck, (home to many industries); Old Mystic; and Mystic (east of the Mystic River). An area that has at one time had both a large whaling and fishing industry, Stonington is home to Connecticut's last commercial fishing fleet. Many of Stonington's early fishermen were Portuguese. As fish were depleted in the 1950s, the industry took a downturn, and the fleet went from 40 trawlers to nine. The fishermen seem to have strong local support, however. The town leases the docks to the fishermen, and in 2001 they signed a 20 year lease, indicating cooperation between the town and the fishing industry (Ross 2001).

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222 These community profiles have been created to serve as port descriptions in Environmental Impact Statements (EISs) for fisheries management actions. They also provide baseline information from which to begin research for Social Impact Assessments (SIAs). Further, they provide information relevant to general community impacts for National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and information on minorities and low income populations for Executive Order (E.O.) 12898 on Environmental Justice.

223 For purposes of citation please use the following template: "Community Profile of *Town, ST*. Prepared under the auspices of the National Marine Fisheries Service, Northeast Fisheries Science Center. For further information contact Lisa.L.Colburn@noaa.gov."

Demographics224

According to Census 2000 data225, Stonington had a total population of 17,906, up 5.8% from the reported population of 16,924 in 1990 (US Census Bureau 1990). Of this 2000 total, 48.6% were males and 51.4% were females. The median age was 41.7 years and 76% of the population was 21 years or older while 20.4% was 62 or older.

Stonington's age structure (see Figure 1) shows peak in the population between the ages of 40 to 49. The age group of 20-29 is smaller compared to the other age groups, indicating that young people are leaving the community after high school.

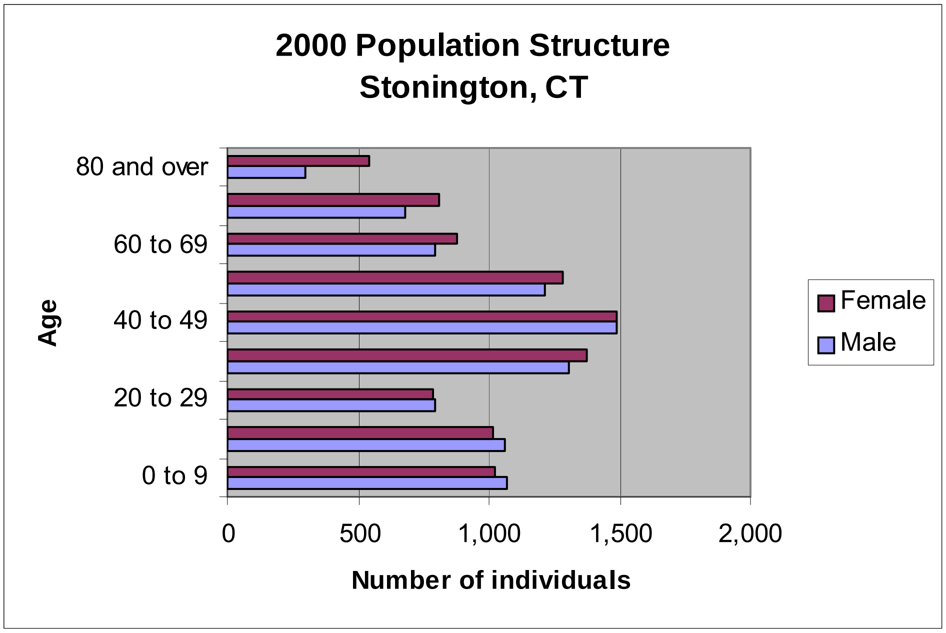

Figure 1. Stonington's population structure by sex in 2000 (US Census Bureau 2000)

The majority of the population was white (95.8%) with 0.6% of residents black or African American, 1.3% Asian, 0.4% Native American, and 0.1% Pacific Islander or Hawaiian (see Figure 2). Only 1.3% of the population identified themselves as Hispanic/Latino (see Figure 3). Residents linked their backgrounds to a number of different ancestries including: Irish (22.5%), English (18.8%), Italian (16.4%), German (12.1%) and Portuguese (7%). With regard to region of birth, 37.3% were born in Connecticut, 56.7% were born in a different state and 5.2% were born outside of the U.S. (including 2% who were not United States citizens).

224 While mid-term estimates are available for some larger communities, data from the 2000 Census are the only data universally available for the communities being profiled in the Northeast. Thus for cross-comparability we have used 2000 data even though these data may have changed significantly since 2000 for at least some communities.
225 These and all census data, unless otherwise referenced, can be found at U.S. Census: American Factfinder 2000 http://factfinder.census.gov/home/saff/main.html; census data used are for Stonington town, New London county; this census data is at the level of County Subdivision.

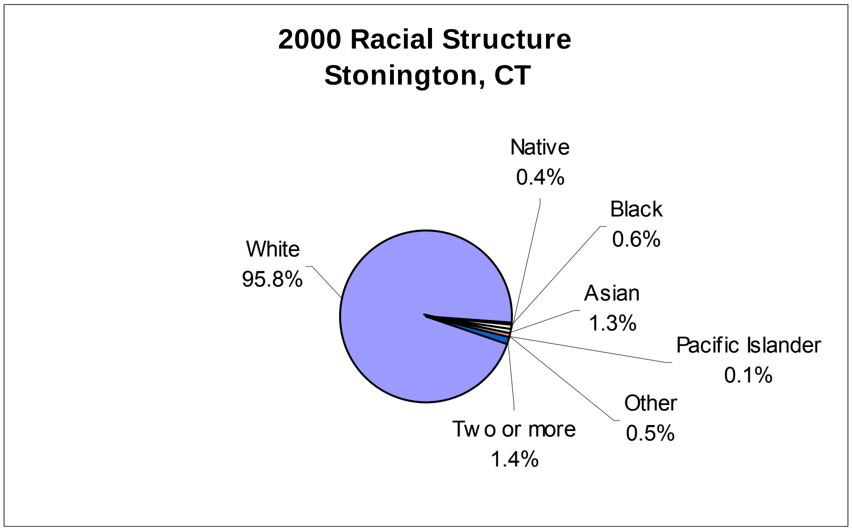

Figure 2. Racial Structure in 2000 (US Census Bureau 2000)

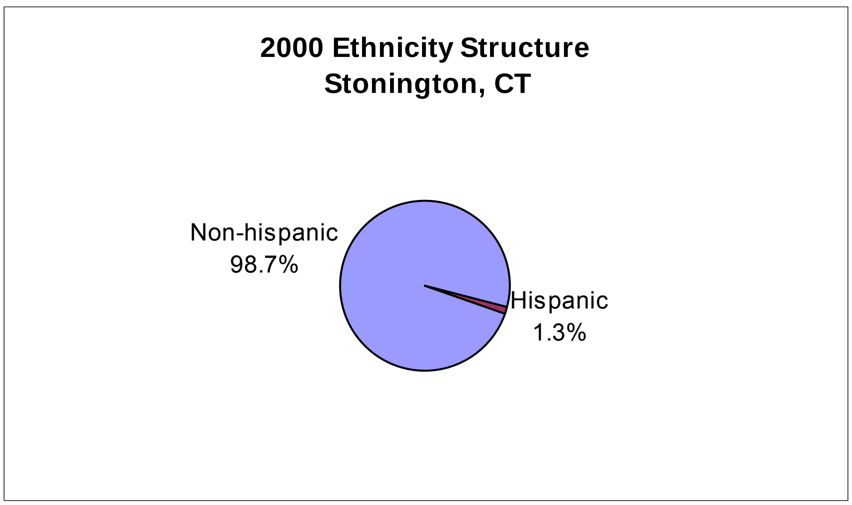

Figure 3. Ethnic Structure in 2000 (US Census Bureau 2000)

For 92.5% of the population, only English was spoken in the home, leaving 7.5% in homes where a language other than English was spoken, including 2.8% of the population who spoke English less than "very well" according to the 2000 Census.

Of the population 25 years and over, 88.2% were high school graduates or higher and 34.6% had a bachelor's degree or higher. Again of the population 25 years and over, 5% did not reach ninth grade, 6.8% attended some high school but did not graduate, 28.5% completed high school, 17.7% had some college with no degree, 7.4% received their associate's degree, 19.2% earned their bachelor's degree, and 15.4% received either their graduate or professional degree.

Although religion percentages are not available through the U.S. Census, according to the Association of Religion Data Archives (ARDA) in 2000, the religion with the highest number of congregations and adherents in New London County was Catholic with 33 congregations and 80,563 adherents. Other prominent congregations in the county were The United Church of Christ (20 with 6,809 adherents), and American Baptist Churches in the USA (19 with 6,502 adherents). The total number of adherents to any religion was down 0.3% from 1990 (ARDA 2000).

Issues/Processes

One issue affecting the fishing industry in Stonington is the continued gentrification and resulting increased housing and property prices around the waterfront. Although most fishing activity is based at the Town Dock which is leased from the town, the escalating cost of housing is forcing many fishermen to move away from the waterfront area (Hall-Arber et al. 2001).

Within the Stonington area, the Pentagon recently included the Naval Submarine Base in nearby Groton on its list of potential base closures, which could have had a significant economic impact on the region. The departure of one of the area's largest employers could have resulted in a loss of thousands of jobs (Baldor 2005). Eventually, the base was removed from the closure list, and is presently working with the Pentagon to upgrade the facilities for future stability.226

Cultural attributes

Every year, the last week end in July, the annual Blessing of the Fleet remembers Stonington's fishermen who have died at sea in a two-day celebration with parades, bands, food, music, dancing on the docks, and a Sunday Mass (Ross 2001). Mystic Seaport in the village of Mystic celebrates seafaring life with a recreation of a historic whaling village and historic tall ships and other restored vessels. The Mystic Aquarium/Institute for Exploration in Mystic is dedicated to inspiring people to care about and protect the oceans through educating them about the underwater world.

Infrastructure

Current Economy

Major industries in the Stonington area which employ large numbers of residents are the defense industry, based in nearby Groton and New London, and the gaming industry, with two large casinos (Foxwoods, Mohegan Sun) located a short distance away (seCTer 2005).

According to the U.S. Census 2000227, 65% (14,450 individuals) of the total population 16 years of age and over were in the labor force (see Figure 4), of which 2% were unemployed, 0.5% were in the Armed Forces, and 62.5% were employed.

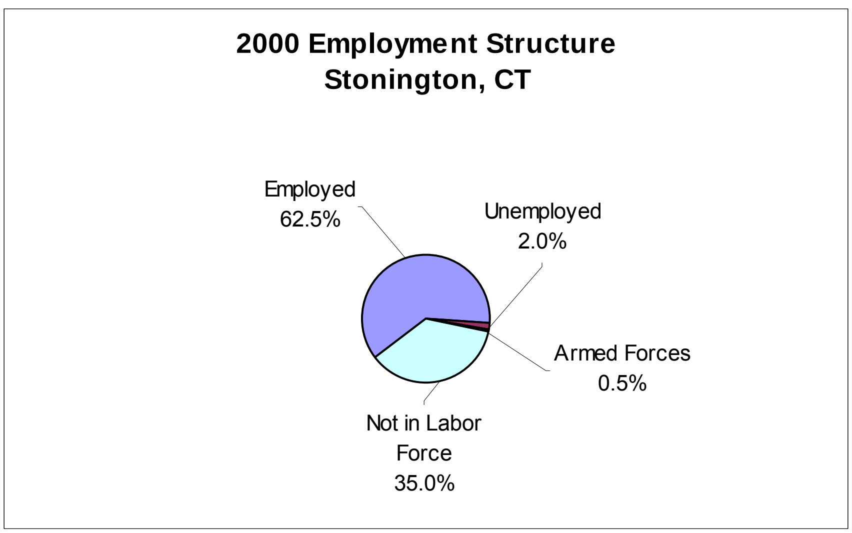

Figure 4. Employment Structure in 2000 (US Census Bureau 2000)

According to Census 2000 data, jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 48 positions or 0.5% of all jobs. Self employed workers, a category where fishermen might be found, accounted for 683 positions or 7.6% of jobs. Educational, health and social services (20.4%), manufacturing (19.3%), and entertainment, recreation, accommodation and food services (15.9%) were the primary industries.

226 Profile review comments, Eric Donch, harbormaster, October 29, 2007

227 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

Median household income in Stonington was $52,437 (up 32.2% from $39664 in 1990 [US Census Bureau 1990]) and median per capita income was $29,653. For full-time year round workers, males made approximately 42.2% more per year than females.

The average family in Stonington consisted of 2.88 persons. With respect to poverty, 2.9% of families (down from 15.9% in 1990 [US Census Bureau 1990]) and 5% of individuals earn below the U.S. Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families, depending on number of persons (2-9 [US Census Bureau 2000a]). In 2000, 19.3% of all families (of any size) earned less than $35,000 per year.

In 2000, Stonington had a total of 8,591 housing units of which 89.2% were occupied and 67.8% were detached one unit homes. Approximately one-third (35%) of these homes were built before 1940. Mobile homes, vans, and boats accounted for 3.1% of housing units; 83.9% of detached units have between 2 and 9 rooms. In 2000, the median cost for a home in this area was $168,200. Of vacant housing units, 5.6% were used for seasonal, recreational, or occasional use. Of occupied, units 29.3% were renter occupied.

Government

Stonington's local government is comprised of three Selectmen and a town clerk (Town of Stonington 2004).

Fishery involvement in government

The Town of Stonington Shellfish Commission regulates the harvest of clams, oysters, scallops, and other shellfish within the town waters. The Commission provides permits for both recreational and commercial shellfishing as well as for aquaculture operations for raising shellfish. The town of Stonington has a harbormaster; there are also harbormasters listed for Mystic and Pawcatuck (CTDOT 2008).

Institutional

Fishing associations

The Southern New England Fishermen and Lobstermen Association (SNEFLA) is located in Stonington alongside the Town Dock, and consists of a president, vice-president, and a nine-person board of directors who are elected annually. The approximately 125 members come from Connecticut, Rhode Island, and Massachusetts. Started in 1931, the original goal of the organization was to assist fishermen and lobstermen with the common problems like the hijacking of trucked shipments of fish to New York. Members must pay $100 to join, and then $20 annually. Stonington Pier grants tie-up space to members of SNEFLA (Hall-Arber et al. 2001).

Fishing assistance centers

Information on fishing assistance centers in Stonington is unavailable through secondary data collection.

Other fishing related organizations

The Portuguese Holy Ghost Society in Stonington was founded in 1914, and is made up of Stonington residents of Portuguese descent (Boylan 1987). The society serves as a social nexus to many of the town's fishermen (Hall-Arber et al. 2001).

Physical

Stonington lies within two hours or less of major research and transportation centers in Boston, Providence, New Haven, Hartford and New York. In addition, Interstate 95 passes through the town. Major airports are located nearby in Groton, Hartford/Springfield, Providence and Boston. Amtrak trains are located in Mystic, New London and Westerly (Hall-Arber 2001).

Stonington town dock fishing pier and memorial is situated in the quaint fishing village of Stonington Borough. Although much of the waterfront property in this village has been converted to residential dwellings, there is still an active marine commercial fishing fleet in the harbor (CTDEP 2007). Stonington's infrastructure consists of a town-owned central fishing wharf (Town Dock) with two processing facilities at which most of the fleet is docked (Hall-Arber et al. 2001).

1. *INVOLVEMENT IN NORTHEAST FISHERIES*228

Commercial

Stonington has a diversified fishing fleet, which includes gillnetters, draggers, and lobster fishermen (Hall-Arber et al. 2001). Stonington Seafood Harvesters Inc. is a family operated sea scallops wholesaler and retailer located in Stonington. Bait and tackle stores are found in town (CTDEP 2008). Lobstermen from Connecticut almost universally buy their bait skate in Rhode Island229.

For 1997-2006, scallops were by far the most significant species landed in Stonington, with average landings over $5 million. The 2006 landings value was slightly higher than this ten-year average value. There were a wide variety of other species landed in Stonington; lobster, summer flounder, scup, and black sea bass, monkfish, largemesh groundfish, smallmesh groundfish, and squid, mackerel, and butterfish all had average landings values of at least $400,000 (see Table 1). Stonington has several commercially-operated aquaculture facilities, raising and harvesting shellfish in the town waters, and regulated by the town's shellfish commission. Scallops are also commercially harvested within the waters regulated by the town (Town of Stonington Shellfish Commission, no date). Overall, landings in Stonington demonstrated an increasing trend until 2004, when landings were at over $12 million; they fell off slightly in 2005 and 2006 (see Table 2). The level of home port fishing in all years was significantly lower than the level of landings. Home port fishing was at its highest in 2004 and 2005, at $2 million and $3.8 million respectively, but the landings in 2006 had fallen to just over $100,000. This indicates that most vessels landing in Stonington are home ported elsewhere. There were a number of home ported vessels in Stonington, falling from a high of 24 in 1997 to a low of 17 in 2006. In every year the number of home ported vessels far exceeded the owner's city vessels, indicating that many vessel owners reside in other communities.

Landings by Species

Table 1. Dollar value by Federally Managed Groups of landings in Stonington

	Average from 1997-2006	2006 only
Scallop	5,268,459	5,690,408
Lobster	969,486	800,218
Summer Flounder, Scup, Black Sea Bass	669,818	759,058
Monkfish	548,713	107,636
Smallmesh Groundfish230	482,725	164,166
Largemesh Groundfish231	473,867	234,212
Squid, Mackerel, Butterfish	445,394	275,485

228 In reviewing the commercial landings data several factors need to be kept in mind. 1) While both federal and state landings are included, some states provide more detailed data to NMFS than others. For example, shellfish may not be included or data may be reported only by county and not by port. 2) Some communities did not have individual port codes until more recently. Before individual port codes were assigned, landings from those ports were coded at the county level or as an aggregate of two geographically close small ports. Where landings were coded at the county level they cannot be sorted to individual ports for those earlier years, e.g., prior to 2000. 3) Where aggregated codes were used, those aggregate codes may still exist and be in use alongside the new individual codes. Here the landings which are still assigned to the aggregate port code cannot be sorted into the individual ports, so port level data are only those which used the individual port code. 4) Even when individual port codes exist, especially for small ports, landings may be coded at the county level. Here again it is impossible to disaggregate these to a port level, making the port level landings incomplete. 5) In all these cases, the per port data in this profile may under report the total level of landings to the port, though all landings are accounted for in the overall NMFS database.

229 Interviews with Walter Anoushian, NMFS Port Agent in Point Judith, RI on October 16, 2008 and with Andrea Incollingo, owner of The Bait Company in Point Judith, RI on October 23, 2008 by Patricia m. Clay of NMFS Northeast Fisheries Science Center.

230 Smallmesh multi-species: red hake, ocean pout, mixed hake, black whiting, silver hake (whiting)

231 Largemesh groundfish: cod, winter flounder, yellowtail flounder, American plaice, sand-dab flounder, haddock, white hake, redfish, and pollock

	Average from 1997-2006	2006 only
Other232	122,965	104,074
Skate	108,756	37,315
Tilefish	6,497	914
Bluefish	4,529	5,839
Herring	3,891	3,518
Dogfish	3,534	13,878
Red Crab	84	0

Vessels by Year233

Table 2. All columns represent vessel permits or landings value combined between 1997-2006

Year	# Vessels (home ported)	# Vessels (owner's city)	Level of fishing home port ($)	Level of fishing landed port ($)
1997	24	10	990,539	6,594,784
1998	19	9	418,333	6,940,038
1999	21	11	87,921	8,697,638
2000	19	11	620,660	9,733,402
2001	20	10	1,146,206	9,898,776
2002	23	12	1,737,018	8,479,559
2003	21	12	823,807	9,411,356
2004	23	12	2,043,818	12,376,800
2005	22	12	3,793,828	10,758,099
2006	17	6	105,746	8,196,721

(Note: # Vessels home ported = No. of permitted vessels with location as homeport
 # Vessels (owner's city) = No. of permitted vessels with location as owner residence234
Level of fishing home port ($) = Landed value of fisheries associated with home ported vessels
Level of fishing landed port ($) = Landed value of fisheries landed in location)

Recreational

There are two charter fishing vessels listed for Stonington (CCPBA 2004). Stonington also has a number of residents and visitors participating in recreational shellfishing which is regulated by the town's shellfish commission (Town of Stonington Shellfish Commission, no date).

Subsistence

Information on subsistence fishing in Stonington is either unavailable through secondary data collection or the practice does not exist.

2. FUTURE

232 "Other" species includes any species not accounted for in a federally managed group
233 Numbers of vessels by owner's city and homeport are as reported by the permit holder on permit application forms. These may not correspond to the port where a vessel lands or even spends the majority of its time when docked.
234 The Owner-City from the permit files is technically the address at which the owner receives mail concerning their permitted vessels, which could reflect the actual location of residence, the mailing address as distinct from residence, owner business location, or the address at which a subsidiary receives mail about the permits.

The Town of Stonington is attempting to receive federal funding to expand the town dock to permit more vessels to dock there. An initial request for funding as part of a transportation appropriations bill was originally rejected by the House of Representatives in 2004.

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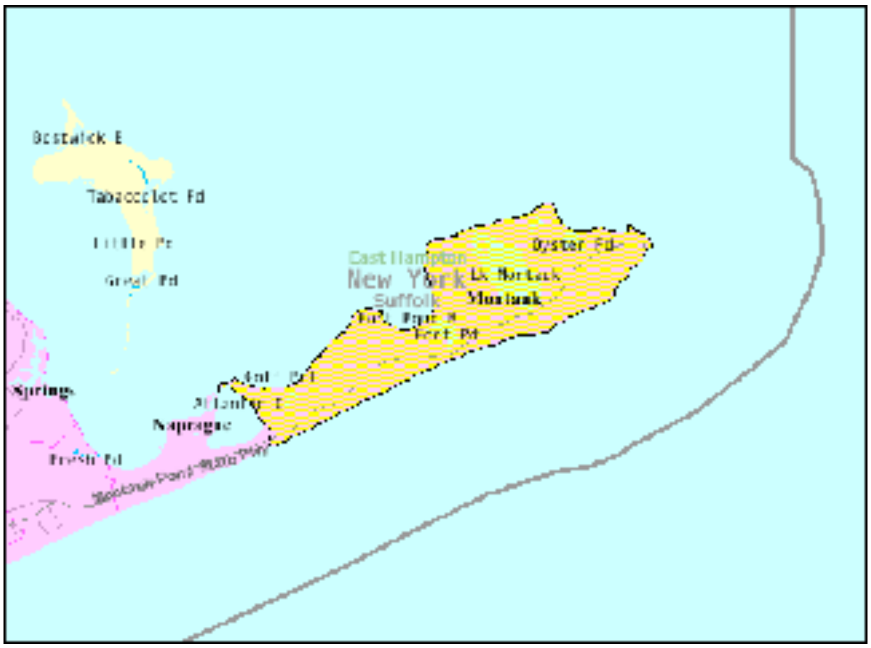
m. MONTAUK, NY[235]

Community Profile[236]

People and Places

Regional orientation

Montauk (41.00°N, 71.57°W) is located in Suffolk County at the eastern tip of the South Fork of Long Island in New York. It is situated between the Atlantic Ocean to the south, and Block Island Sound to the north, about 20 miles off the Connecticut coast. The total area of Montauk is about 20mi², of which 2.3 mi² of it (11.5%) is water (USGS 2008).



Map 14. Location of Montauk, NY

Historical/Background

Montauk was originally inhabited by the Montauket tribe, who granted early settlers permission to pasture livestock here, essentially the only function of this area until the late 1800s. The owner of the Long Island Railroad extended the rail line here in 1895, hoping to develop Montauk "the first port of landing on the East Coast, from which goods and passengers would be transported to New York via the rail. While his grandiose vision was not fulfilled, the rail provided the necessary infrastructure for the transportation of seafood, and Montauk soon became the principal commercial fishing port on the East End. In the early 1900s, the railroad also brought recreational fishermen to the area from the city by the car-load aboard the 'Fishermen's Special', depositing them right at the

235 These community profiles have been created to serve as port descriptions in Environmental Impact Statements (EISs) for fisheries management actions. They also provide baseline information from which to begin research for Social Impact Assessments (SIAs). Further, they provide information relevant to general community impacts for National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and information on minorities and low income populations for Executive Order (E.O.) 12898 on Environmental Justice.
236 For purposes of citation please use the following template: "Community Profile of *Town, ST*. Prepared under the auspices of the National Marine Fisheries Service, Northeast Fisheries Science Center. For further information contact Lisa.L.Colburn@noaa.gov."

dock where they could board sportfishing charter and party boats." Montauk developed into a tourist destination around that time, and much of the tourism has catered to the sportfishing industry since (Montauk Sportfishing 2005).

*Demographics**237***

According to Census 2000 data, Montauk had a total population of 3,851, up 28.3% from a reported population of 3,001 in 1990. Of this 2000 total, 51.3% were males and 48.7% were females. The median age was 39.3 years and 77.4% of the population was 21 years or older while 17.7% were 62 or older.

Montauk's age structure (Figure 1) showed large variation between sexes in different age groups. It is important to note that the differences appear dramatic because this population is small. In the age group including people from 20 to 29 years old, there were more than twice as many males as females in Montauk. A similar pattern exists in the 30 to 39 year age group. This is probably because males come to the area to work after high school for demanding labor jobs such as landscaping and construction. Females do not traditionally seek after these types of jobs that are available in Montauk.

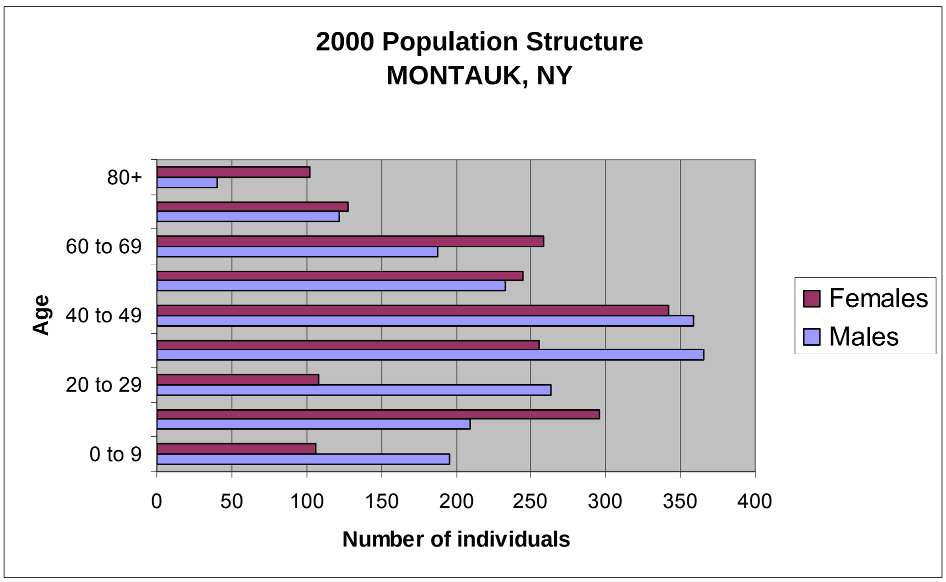


Figure 1. Montauk's population structure by sex in 2000 (US Census Bureau 2000)

The majority of the population of Montauk was White (88.2%), with 0.9% of residents Black or African American, 0.1% Native American, 0.8% Asian, and none Pacific Islander or Hawaiian (Figure 2). A reported 23.9% of the population identified themselves as Hispanic/ Latino (Figure 3). Residents linked their backgrounds to a number of different ancestries including: Irish (26.5%), German (17.3%) and Italian (13.1%). With regard to region of birth, 61.1% were born in New York, 11.1% were born in a different state and 27.0% were born outside of the U.S. (including 21.2% who were not United States citizens).

237 While mid-term estimates are available for some larger communities, data from the 2000 Census are the only data universally available for the communities being profiled in the Northeast. Thus for cross-comparability we have used 2000 data even though these data may have changed significantly since 2000 for at least some communities.

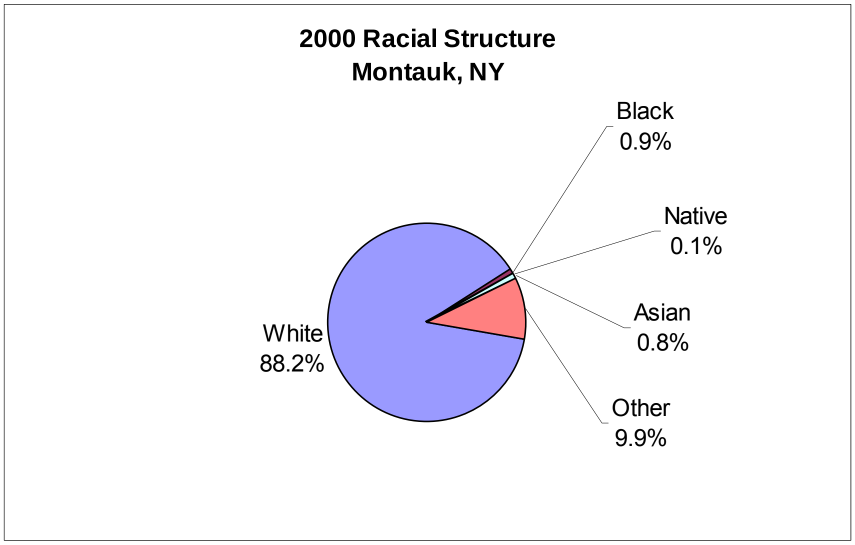


Figure 2. Racial Structure in 2000 (US Census Bureau 2000)

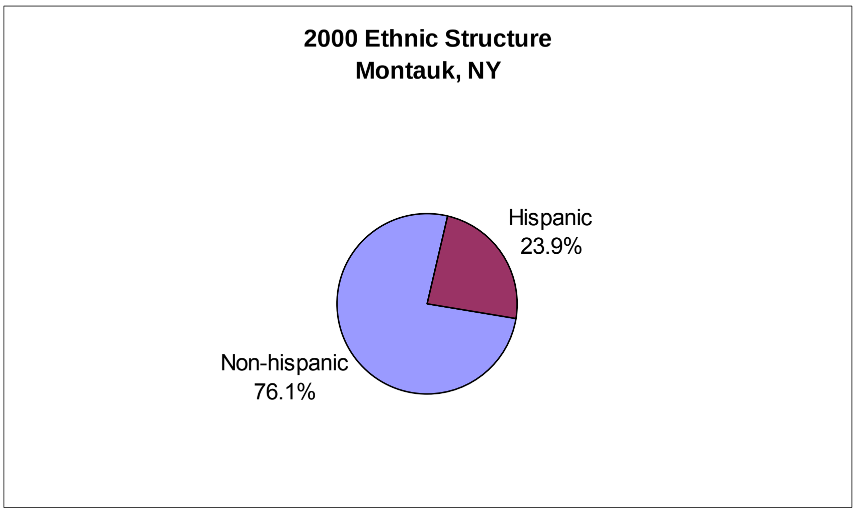


Figure 3. Ethnic Structure in 2000 (US Census Bureau 2000)

For 69.7% of the population, only English was spoken in the home, leaving 30.3% in homes where a language other than English was spoken, including 15.6% of the population spoke English less than "very well" according to the 2000 Census.

Of the population 25 years and over, 84% were high school graduates or higher and 24.8% had a bachelor's degree or higher. Again of the population 25 years and over, 7.6% did not reach ninth grade, 8.4% attended some high school but did not graduate, 31.9% completed high school, 19.6% had some college with no degree, 7.8% received an associate's degree, 17.0% earned a bachelor's degree, and 7.8% received either a graduate or professional degree.

Although religion percentages are not available through the U.S. Census, according to the Association of Religion Data Archives (ARDA) in 2000, the religion with the highest number of congregations and adherents in Suffolk County was Catholic with 72 congregations and 734,147 adherents. Other prominent congregations in the county were Jewish (48 with 100,000 adherents), United Methodist (47 with 22,448 adherents), Episcopal (40 with 16,234 adherents), Evangelical Lutheran Church (26 with 19,378 adherents), and Muslim (9 with 12,139 adherents). The total number of adherents to any religion was up 3.8% from 1990 (ARDA 2000).

i.Issues/Processes

Some fishermen are concerned about the accuracy of their assigned historical landings by species for fisheries (often used for promulgating new regulations), as the method used to land fish in New York varies from that in most other states. Called the "box method" it involves fish being boxed at sea, then landed at a consignment dock and from there shipped to Hunts Point Market in the Bronx, New York. Prior to the implementation of dealer electronic reporting NMFS port agents counted the number of boxes landed from each vessel and received a species breakdown from the dock manager (who did not open the boxes but rather based the breakdown on his knowledge of the vessel's general fishing patterns). This system allowed greater potential for accidental misreporting. Now, the boxes are landed at the consignment dock and immediately shipped to Fulton, where the dealer opens the boxes and reports the landings. (Further, individual fishermen report using VTR, logbooks and other methods.)

While this method is more accurate in terms of the number and type of fish landed, it can still lead to another type of accidental reporting error. That is, landings are assigned to the incorrect state. This can have inequitable effects on states should an allocation scheme be developed, such as the one for summer flounder, that bases a state's allocation on the landings of a particular species in that state.

The docks make money by charging $10-12 per box (2007 prices) and by selling fuel. Catch limits and trip limits reduce the number of boxes to be shipped, and have made it very difficult for the docks to stay in business. New York is losing much of its infrastructure, and many of the docks have closed or changed hands in recent years.[238]

Inlet Seafood, the largest seafood packing operation in the state, recently expanded their facility to include a restaurant and convenience store, which met with considerable opposition from those living in the surrounding neighborhood, as residents were concerned about a resulting increase in traffic (Packer and McCarthy 2005). There are very strict zoning regulations in the town, which make it very difficult for any industry located on the waterfront to expand (McCay and Cieri 2000). There was also a bill proposed recently to limit beach access by vehicles in areas where coastal erosion is a problem, which would restrict access to many of the spots favored by surf casters in Montauk (Anonymous 2005a). There is also concern that recent regulations reducing allowable catches of certain species by recreational fishermen will have a negative impact on the party and charter fishing industry (Anonymous 2004).

The Long Island Power Authority is seeking permission to construct a wind farm off Long Island, a proposal which has met with opposition from commercial fishermen in Montauk and elsewhere on the island, because the turbines will block access to a highly productive squid fishery (Anonymous 2005b). The lobstermen working out of Montauk have seen their industry decline largely because of the prevalence of shell disease in lobsters taken from Long Island Sound (von Bubnoff 2005).

Cultural attributes

Montauk has several annual festivities that celebrate sport fishing and one that celebrates commercial fishing. The Blessing of the Montauk Fleet takes place in June. The Grand Slam Fishing Tournament has been in Montauk since 2002. The Harbor Festival at Sag Harbor, which is located next to Montauk, is celebrated in September. There is also a Redbone Fishing Tournament, the Annual Striped Bass Derby (13th year in 2005), and the Annual Fall Festival (24th year in 2005), which is includes shellfish related activities such as a clam chowder festival and clam shucking (Montauk Chamber of Commerce nd). There is also a monument in Montauk dedicated to over 100 commercial fishermen from the East End who have lost their lives at sea over the years (Oles 2005).

V. INFRASTRUCTURE

Current Economy

The majority of the employers in Montauk are seasonal and dependent on the tourist industry, including restaurants and hotels. Probably the largest seasonal employer is Gurney's Inn, which is a resort hotel, spa, and conference center, open year round, with 350 employees during the summer months.239 "With the exception of a few resorts and retail businesses, (Inlet Seafood) is one of the only full-time, year-round employers in Montauk,

238 Personal Communication, Erik Braun, NMFS port agent, E. Hampton, NY, July 22, 2005
239 Personal communication, Gurney's Inn, 290 Old Montauk Highway, Montauk, NY 11954, July 19, 2005.

employing between four and six dock workers, a secretary, and a manager. All of the employees live in Montauk or East Hampton, but housing is a problem due to the high cost of living in the area. Labor turnover is low due to the ability of the dock to provide equitable wages and predictable pay throughout the year. The dock does compete with landscaping and construction companies for labor, especially from among immigrant populations. All of the dock workers are immigrants from Central and South America" (Oles 2005). Many of the fishermen have had to learn Spanish to communicate with the dock workers. This has been a dramatic change within the last 5 years, said NMFS port Agent Erik Braun. He also stated that there are no new fishermen starting up, and the children of fishermen, even those that are doing well, are not encouraged to enter into this business.240 The marinas here also employ a large number of people, including Montauk Marine Basin, with 21 employees during the summer months.241

According to the U.S. Census 2000242, 61.5% (1,944 individuals) of the total population 16 years of age and over were in the labor force (Figure 4), of which 7.7% were unemployed, none were in the Armed Forces, and 53.8% were employed.

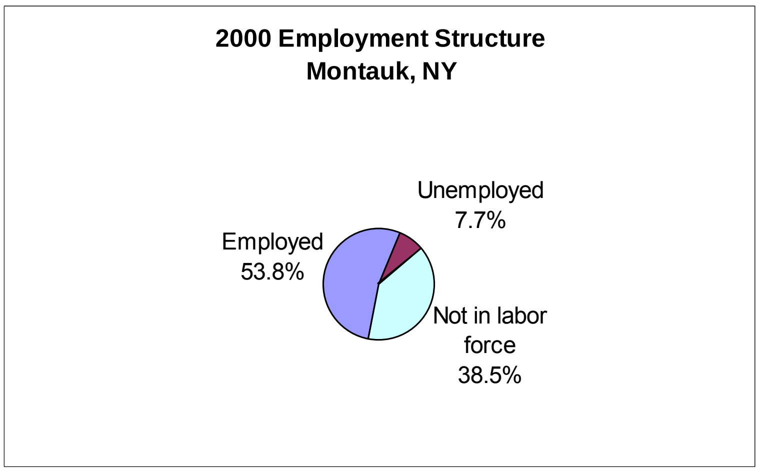


Figure 4. Employment Structure in 2000 (US Census Bureau 2000)

According to Census 2000 data, jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 103 positions or 6.1% of all jobs. Self employed workers, a category where fishermen might be found, accounted for 314 positions or 18.5% of jobs. Arts, entertainment, recreation, accommodation and food services (20.3%), construction (18.5%) and retail trade (10.1%) were the primary industries.

Median household income in Montauk was $42,329 (up 32.9% from $23,875 in 1990 [US Census Bureau 1990]). For full-time year round workers, males made approximately 41.6% more per year than females.

The average family in Montauk consists of 2.90 persons. With respect to poverty, 8.3% of families (unchanged from 1990 [US Census Bureau 1990]) and 10.6% of individuals earned below the official U.S. Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239-35,060 for families, depending on number of persons (2-9) (US Census Bureau 2000b). In 2000, 40.0% of all families (of any size) earned less than $35,000 per year.

In 2000, Montauk had a total of 4,815 housing units of which 33.1% were occupied and 61.7% were detached one unit homes. Less than 10% (9.4%) of these homes were built before 1940. Mobile homes, boats, RVs, and vans accounted for 4.0% of the total housing units; 84.1% of detached units had between 2 and 9 rooms. In 2000, the median cost for a home in this area was $290,400. Of vacant housing units, 62.9% were used for seasonal, recreational, or occasional use, while of occupied units 34.3% were renter occupied.

240 Personal Communication, Erik Braun, NMFS port agent, E. Hampton, NY, July 22, 2005

241 Personal communication, Montauk Marine Basin, 426 W. Lake Dr., Montauk, NY 11954, July 19, 2005

242 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

Government

Montauk is an unincorporated village within East Hampton Township. The Town Board runs the town (Town of East Hampton nd). The town was established in 1788. Although Montauk is not incorporated, there is one incorporated village situated within the East Hampton's borders, the Village of East Hampton, and part of a second village, Sag Harbor (Town of East Hampton nd).

Fishery involvement in government

The Town Board of East Hampton organized a "Fishing Committee" to represent the fishing industry's interests in the development of the town's comprehensive plan (Oles 2005).

Institutional

Fishing associations

The Long Island Commercial Fishing Association, located in Montauk, promotes commercial fishing throughout Long Island (Oles 2005). The Montauk Tilefish Association (MTA) "is a registered non-profit organization whose objective is to provide an organizational structure for making collective decisions for its members. "The MTA also provides member protection under the Fishermen's Collective Marketing Act" (Oles 2005). Further, it "has worked to create and foster a fisheries management regime that is efficient and encourages resource stewardship at the local level. Other important outcomes from this collaboration include fresher fish for the market and a more stable operating environment" (Kitts et al. 2007).

The New York Seafood Council is the larger association representing fishing interests in the state. "The New York Seafood Council (NYSC) is an industry membership organization comprised of individuals, businesses, or organizations involved in the harvesting, processing, wholesale, distribution or sale of seafood products or services to the seafood industry in New York" (NYSC 2008).

Fishing assistance centers

Information on fishing assistance centers in Montauk is unavailable through secondary data collection.

Other fishing-related organizations

The Montauk Boatmen's and Captain's Association has a membership of over 100 captains of charter and party boats, and is one of the only organized, politically active charter boat associations in New York (Oles 2005). The Montauk Surfcasters Association is an organization of surf fishermen with over 900 members who wish to preserve their access to surf casting on the East End beaches of Long Island. They hold beach clean-ups and educate the public about the proper use of the beach (Montauk Surfcasters Association nd).

Physical

The fishing fleet is located in Lake Montauk, which opens to the north onto Block Island Sound. "Montauk is connected to points west via Route 27, and the Metropolitan Transportation Authority's Long Island Rail Road." Montauk Airport on East Lake Drive provides another mode of access to the area, but is strictly for small, private aircraft. On the easternmost tip of Long Island, Montauk is roughly 117 miles from New York City, but only about 20 miles by boat from New London, CT. There is one small airport in Montauk, and Long Island Islip MacArthur Airport is 67 miles away (MapQuest 2005). During the summers, a ferry service runs between Montauk and New London on weekends, daily to Block Island, RI, and occasionally to Martha's Vineyard (Viking Fleet nd). There are also three different ferry services that run between New London and nearby Sag Harbor (Easthampton.com nd). Most fish landed in Montauk is sold at the Fulton Fish Market in New York City (McCay and Cieri 2000).

The infrastructure needed for a commercial and sport fishing fleet is available in the village, including docks with off-loading facilities and other services that commercial fishermen need to land their catch (NYSC

2008). Montauk used to have five docks used by the commercial fishing industry for packing out fish, but they now only have two.243 Inlet Seafood Company, a corporation owned by six Montauk fishermen (NYSC 2008), includes a dock with unloading and other services, and is the largest fish packing facility in the state (Easthampton Star 2003). There is another dock servicing commercial fishermen, but this dock is barely surviving financially.244 There are also at least fourteen marinas used by the sportfishing industry (Oles 2005).

Involvement in Northeast Fisheries245

Commercial

The village of Montauk is the largest fishing port in the state of New York. Montauk's main industry has been fishing since colonial times, and it continues to be an important part of its economy and traditions (Oles 2005). Montauk is the only port in New York still holding on to a commercial fishing industry.246 Montauk's location naturally provides a large protected harbor on Lake Montauk and is close to important fishing grounds for both commercial and recreational fishermen.

Montauk has a very diverse fishery, using a number of different gear types and catching a variety of species; in 1998, there were a total of 90 species landed in Montauk (McCay and Cieri 2000). According to NMFS Landings Data, the top three valued fisheries in 2003 were Squid ($2.3million), Golden Tilefish ($2.1million), and Silver Hake ($2.1million). There was a striking difference between the 2006 scallop landings value and the value for the 1997-2006 average. The 2006 values were over $1.5 more than the nine year average (Table 1).

There used to be a number of longline vessels that fish out of Montauk, including 4-5 fishing for tilefish and up to 8 fishing for tuna and swordfish. Additionally, a number of longline vessels from elsewhere in New York State and New Jersey sometimes land their catch at Montauk (NYSC 2008). As of April 2007, there were 3 tilefish longliners in Montauk, one of which has bought out a fourth.247 There were also 35-40 trawlers based in Montauk, with a number of others that unload their catch here, and between 10-15 lobster vessels (NYSC 2008). The six owners of Inlet Seafood each own 1-2 trawlers.248 There are also a number of baymen working in the bays around Montauk catching clams, scallops, conch, eels, and crab as well as some that may fish for bluefish and striped bass. However, these baymen may move from one area to another depending on the season and fishery, and as a result may not be a part of the permanent fleet here (NYSC 2008). In 2007, Montauk was 15th out of 15 ports with skate landings of 100,000lbs or higher.

Speaking of Long Island in general NMFS Port Agent Victor Vecchio noted that maybe 10-15% of skates landed come in on monkfish gillnetters, with the about 80% coming off trawlers, and the remainder coming from pound nets (which are still popular on Long Island – inshore state fishery). "Every dragger has 3-5 baskets of skates."249

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243 Personal Communication, Erik Braun, NMFS port agent, E. Hampton, NY, July 22, 2005
244 Personal Communication, Erik Braun, NMFS port agent, E. Hampton, NY, July 22, 2005
245 In reviewing the commercial landings data several factors need to be kept in mind. 1) While both federal and state landings are included, some states provide more detailed data to NMFS than others. For example, shellfish may not be included or data may be reported only by county and not by port. 2) Some communities did not have individual port codes until more recently. Before individual port codes were assigned, landings from those ports were coded at the county level or as an aggregate of two geographically close small ports. Where landings were coded at the county level they cannot be sorted to individual ports for those earlier years, e.g., prior to 2000. 3) Where aggregated codes were used, those aggregate codes may still exist and be in use alongside the new individual codes. Here the landings which are still assigned to the aggregate port code cannot be sorted into the individual ports, so port level data are only those which used the individual port code. 4) Even when individual port codes exist, especially for small ports, landings may be coded at the county level. Here again it is impossible to disaggregate these to a port level, making the port level landings incomplete. 5) In all these cases, the per port data in this profile may under report the total level of landings to the port, though all landings are accounted for in the overall NMFS database.
246 Personal Communication, Erik Braun, NMFS port agent, E. Hampton, NY, July 22, 2005
247 José Montañez, MAFMC, April 18, 2007; NMFS landings data.
248 Personal Communication, Erik Braun, NMFS port agent, E. Hampton, NY, July 22, 2005
249 Pers. com. Victor Vecchio, NMFS Port Agent in Montauk, NY, October 31, 2008.

Montauk has the 2nd highest number of skate dealers in the Northeast Rgion (17) in 2007, but Vecchio notes that they are almost exclusively vessels which have a dealer license so they can sell directly to local pot fishermen, rather than the sort of separate dealer found in many other areas of the Northeast.250

The number of vessels home ported in Montauk showed a slightly decreasing trend between 1997 and 2006, while the number of vessels whose owner's city was Montauk showed a slight increasing trend over the same time period. Both the level of fishing home port and landed port also stayed fairly consistent, with a jump in 2005, but generally ranging from over $9 million to over $16 million for the 1997-2006 year period (Table 2). Montauk has the 5th highest number of skate permits by homeport and the 4th highest by owner's town of residence for 2007.

Landings by Species

Table 1. Dollar value of Federally Managed Groups of landing in Montauk

	Average from 1997-2006	2006 only
Squid, Mackerel, Butterfish	3,146,620	3,640,565
Tilefish	2,366,489	2,942,310
Smallmesh Groundfish251	2,028,574	1,198,711
Summer Flounder, Scup, Black Sea Bass	1,964,880	3,900,690
Other252	1,652,214	1,379,958
Largemesh Groundfish253	646,634	426,272
Lobster	585,627	613,598
Monkfish	373,486	643,731
Scallop	366,169	1,869,196
Bluefish	91,346	123,277
Skate	29,360	40,981
Dogfish	9,895	1,323
Herring	413	874
Surf Clams, Ocean Quahog	20	150
Salmon	9	90
Red Crab	5	CONFIDENTIAL

*Vessels by Year***254**

Table 2. All columns represent vessel permits or landings value combined between 1997-2006

Year	# Vessels (home ported)	# vessels (owner's city)	Level of fishing home port ($)	Level of fishing landed port ($)
1997	165	89	9,222,288	13,556,572
1998	146	88	9,652,978	12,080,693
1999	158	98	10,863,508	12,124,707
2000	166	103	10,286,306	13,139,382
2001	160	103	12,302,916	13,231,619
2002	153	99	11,981,882	11,131,789
2003	152	104	12,405,663	11,033,366

250 Pers. com. Victor Vecchio, NMFS Port Agent in Montauk, NY, October 31, 2008.
251 Smallmesh multi-species: red hake, ocean pout, mixed hake, black whiting, silver hake (whiting)
252 "Other" species includes any species not accounted for in a federally managed group
253 Largemesh groundfish: cod, winter flounder, yellowtail flounder, American plaice, sand-dab flounder, haddock, white hake, redfish, and pollock
254 Numbers of vessels by owner's city and homeport are as reported by the permit holder on permit application forms. These may not correspond to the port where a vessel lands or even spends the majority of its time when docked.

Year	# Vessels (home ported)	# vessels (owner's city)	Level of fishing home port ($)	Level of fishing landed port ($)
2004	152	98	11,243,881	13,061,890
2005	144	96	14,104,902	16,475,642
2006	145	96	13,517,890	16,781,742

 # Vessels home ported = No. of permitted vessels with location as homeport
 # Vessels (owner's city) = No. of permitted vessels with location as owner residence255
Level of fishing home port ($) = Landed value of fisheries associated with home ported vessels
Level of fishing landed port ($) = Landed value of fisheries landed in location

Recreational

Montauk is the home port of a large charter and party boat fleet, and a major site of recreational fishing activity (Oles 2005). The facilities supporting the recreational fishing industry include six bait and tackle shops and 19 fishing guide and charter businesses.

According to one website there are at least 27 fishing charters in Montauk. Montauk has been called the "sport fishing capital of the world", and even has its own magazine dedicated to Montauk sportfishing (Montauk Sportfishing nd). Between 2001- 2005, there were 122 charter and party vessels making 18,345 total trips registered in logbook data by charter and party vessels in Montauk carrying a total of 185,164 anglers.

Subsistence

Information on subsistence fishing in Montauk is either unavailable through secondary data collection or the practice does not exist.

w. FUTURE

The comprehensive plan for the town of East Hampton recognizes the importance of the commercial and recreational fishing industries here, and includes a commitment to supporting and retaining this traditional industry (Oles 2005). There has been discussion of developing a large wholesale seafood market on Long Island similar to the Fulton Fish Market so that fish caught here could be sold directly on Long Island rather than being shipped to New York City (NY Sea Grant nd).

Nonetheless Erik Braun, the port agent for this part of New York, was not hopeful about the future of the fishing industry. He said there are no new fishermen getting into commercial fishing, and that even those who have done well are not encouraging their children to get into the industry. Much of the fishing infrastructure is disappearing, and those who own docks can make much more by turning them into restaurants. Montauk is the one port still holding on to a commercial fishing industry, however.256

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255 The Owner-City from the permit files is technically the address at which the owner receives mail concerning their permitted vessels, which could reflect the actual location of residence, the mailing address as distinct from residence, owner business location, or the address at which a subsidiary receives mail about the permits.
256 Personal Communication, Erik Braun, NMFS port agent, E. Hampton, NY, July 22, 2005

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n. HAMPTON BAYS/SHINNECOCK, NY[257]

Community Profile[258]

People and Places

Regional orientation

Hampton Bays and Shinnecock here are considered to be the same community. Shinnecock is the name of the fishing port located in Hampton Bays on the barrier island next to Shinnecock Inlet, and does not actually refer to a geopolitical entity. Fishermen use either port name in reporting their catch, but they are considered to be the same physical place.

The hamlet of Hampton Bays is located on the southern coast of Long Island, NY in the town of Southampton. Southampton is a very large township, encompassing 128 square miles. Hampton Bays is on the west side of Shinnecock Bay, a bay protected from the Atlantic by a barrier island and accessed through Shinnecock Inlet. The Shinnecock Canal connects Shinnecock Bay with Great Peconic Bay to the north, allowing vessels to pass between the southern and northern sides of Long Island without having to travel east around Montauk (Town of Southampton nd).

Historical/Background

The first inhabitants of this area were Native Americans from the Shinnecock tribe, people who still reside in Southampton today on the Shinnecock Reservation. The first European settlers arrived here in 1640, from Lynn, Massachusetts. Sag Harbor in Southampton was an important whaling port early on, and along with agriculture was the town's primary industry. Starting in the 18th century, residents would dig inlets between Shinnecock Bay and the Atlantic Ocean to allow water in the Bay to circulate, and to increase fish and shellfish productivity in the bay. The Shinnecock Canal, connecting Shinnecock Bay with Peconic Bay, was built in 1892 (Oles 2005). During the 1870s, as the Long Island Railroad running between New York City and Montauk was completed, the communities in Southampton became important tourist destinations where New York City residents built their summer homes, and it retains this distinction today as a vacation destination for New Yorkers. The population of Southampton grows considerably during the summer months, and at its peak is nearly triple the winter population (Town of Southampton nd). Hampton Bays is the most populous of eighteen unincorporated hamlets within Southampton (Oles 2005).

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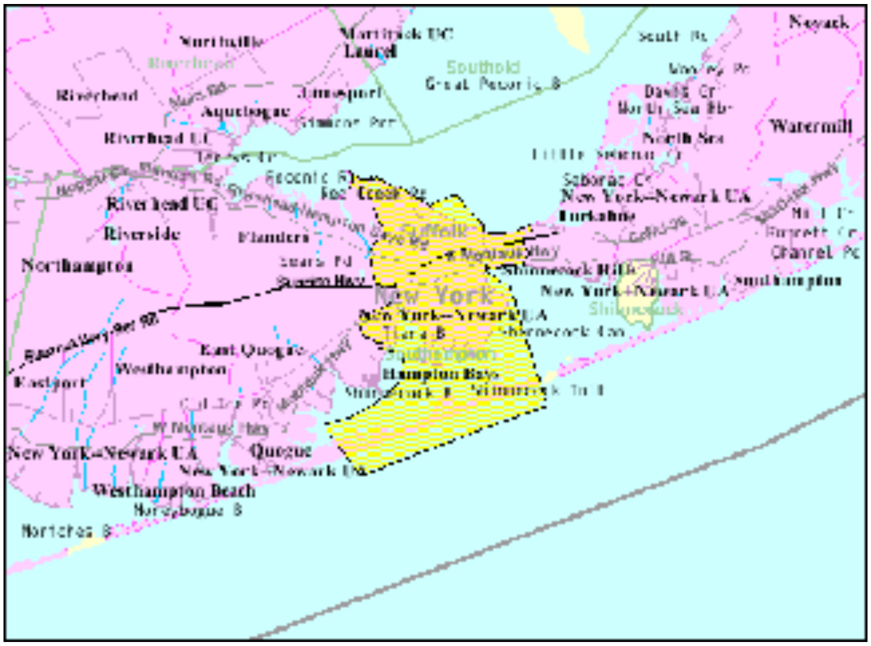
257 These community profiles have been created to serve as port descriptions in Environmental Impact Statements (EISs) for fisheries management actions. They also provide baseline information from which to begin research for Social Impact Assessments (SIAs). Further, they provide information relevant to general community impacts for National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and information on minorities and low income populations for Executive Order (E.O.) 12898 on Environmental Justice.

258 For purposes of citation please use the following template: "Community Profile of *Town, ST*. Prepared under the auspices of the National Marine Fisheries Service, Northeast Fisheries Science Center. For further information contact Lisa.L.Colburn@noaa.gov."

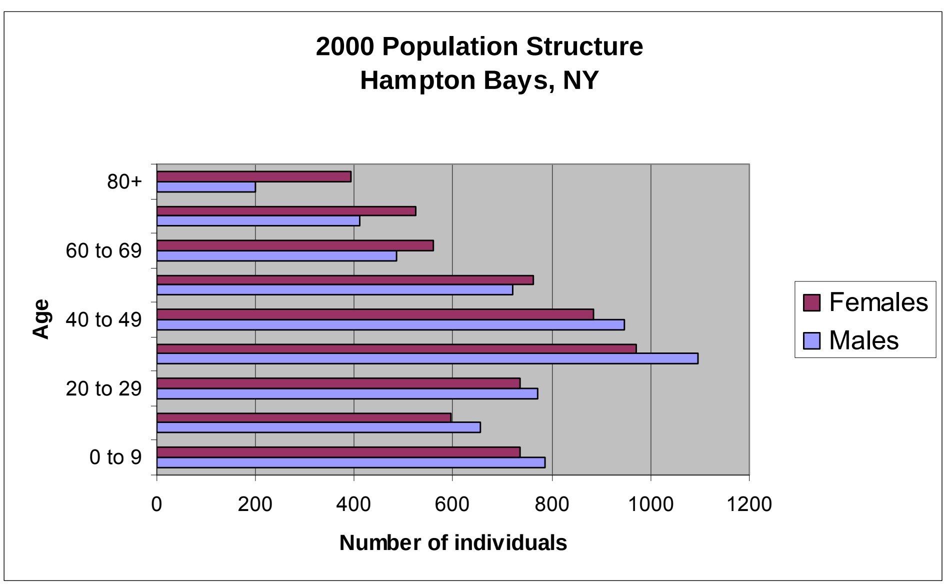


Map 1. Location of Hampton Bays, NY (US Census Bureau 2000)

Demographics259

According to Census 2000 data, Hampton Bays had a total population of 12,236, up 55.0% from 7,893 in 1990. Of this total in 2000, 50.4% were female and 49.6% were male. The median age was 38.8 years and 76.3% of the population was 21 years or older while 19.1% were 62 or older.

Hampton Bays' age structure showed the majority of residents to be in the 30-39 and 40-49 year old age categories (see Figure 1). There is a relatively even distribution of men and women in all age categories. A slight dip in the number of 10-19 year olds probably indicates students leaving for college at this time, but there is nothing to demonstrate significant migration either in or out of Hampton Bays.



259 While mid-term estimates are available for some larger communities, data from the 2000 Census are the only data universally available for the communities being profiled in the Northeast. Thus for cross-comparability we have used 2000 data even though these data may have changed significantly since 2000 for at least some communities.

Figure 1. Hampton Bays' population structure by sex in 2000 (US Census Bureau 2000)

The majority of the population of Hampton Bays in 2000 was white (92.8%), with 1.1% of residents Black or African American, 0.4% Native American, 0.9% Asian, and 0.1% Pacific Islander or Hawaiian (Figure 2). A total of 12.5% of the total population identified themselves as Hispanic/Latino (Figure 3). Residents linked their heritage to a number of different ancestries including: Irish (25.7%), Italian (21.6%), German (17.3%), and English (11.6%). With regard to region of birth, 74.7% were born in New York, 10.8% were born in a different state and 13.4% were born outside of the U.S. (including 8.7% who were not United States citizens).

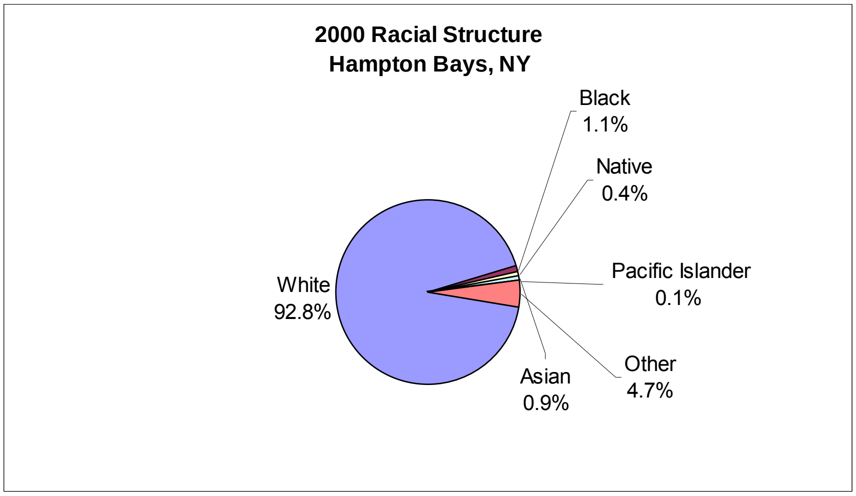


Figure 2. Racial Structure in 2000 (US Census Bureau 2000)

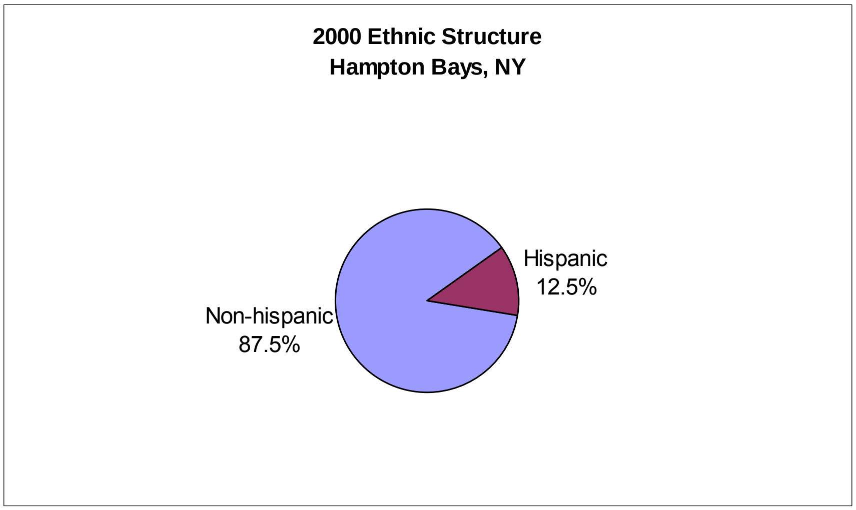


Figure 3. Ethnic Structure in 2000 (US Census Bureau 2000)

For 82.8% of the population 5 years old and higher in 2000, only English was spoken in the home, leaving 17.2% in homes where a language other than English was spoken, and including 9.2% of the population who spoke English less than 'very well'.

Of the population 25 years and over, 86.6% were high school graduates or higher and 25.9% had a bachelor's degree or higher. Again of the population 25 years and over, 5.3% did not reach ninth grade, 8.0% attended some high school but did not graduate, 33.2% completed high school, 20.8% had some college with no degree, 6.7% received an associate's degree, 16.0% earned a bachelor's degree, and 9.9% received either a graduate or professional degree.

Although religious percentages are not available through the U.S. Census, according to the Association of Religion Data Archives (ARDA) in 2000 the religion with the highest number of congregations and adherents in Suffolk County was Catholic with 72 congregations and 734,147 adherents. Other prominent congregations in the county were Jewish (48 with 100,000 adherents), United Methodist (47 with 22,448 adherents), Episcopal (40 with 16,234 adherents), Evangelical Lutheran Church (26 with 19,378 adherents), and Muslim (9 with 12,139 adherents). The total number of adherents to any religion was up 3.8% from 1990 (ARDA 2000).

Issues/Processes

The population of the town of Southampton has been growing steadily, and a number of seasonal home owners are choosing to live here year round. This is changing the population structure and dynamics of the town, and is likely to cause house prices to increase in an area where affordability is already a problem. The area around Shinnecock Inlet is one where much growth is expected to occur (Town of Southampton nd). As in many other coastal communities with a fishing industry, the soaring costs of waterfront property make it very difficult for fishermen and others in the industry to afford or retain necessary waterfront property for water access (Town of Southampton nd). Most of the infrastructure at Shinnecock has disappeared in the last few years; where there were at one time three docks for commercial fishermen to pack out at, now only one remains.

Some fishermen are concerned about the accuracy of their assigned historical landings by species for fisheries (often used for promulgating new regulations), as the method used to land fish in New York varies from that in most other states. Called the "box method" it involves fish being boxed at sea, then landed at a consignment dock and from there shipped to Fulton Fish Market in New York City. Prior to the implementation of dealer electronic reporting, NMFS port agents counted the number of boxes landed from each vessel and received a species breakdown from the dock manager (who did not open the boxes but rather based the breakdown on his knowledge of the vessel's general fishing patterns). This system allowed greater potential for accidental misreporting. Now, the boxes are landed at the consignment dock and immediately shipped to Fulton, where the dealer opens the boxes and reports the landings. Further, individual fishermen report using VTR, logbooks and other methods.

While this method is more accurate in terms of the number and type of fish landed, it can still lead to another type of accidental reporting error. That is, landings are assigned to the incorrect state. This can have inequitable effects on states should an allocation scheme be developed, such as the one for summer flounder, that bases a state's allocation on the landings of a particular species in that state.

The docks make money by charging \$10-\$12 per box (2007 prices) and by selling fuel. Catch limits and trip limits reduce the number of boxes to be shipped, and have made it very difficult for the docks to stay in business. New York is losing much of its infrastructure, and many of the docks have closed or changed hands in recent years.260

In recent years some vessels have been repossessed, which signifies a great change in a fishery where there was always money to be made at one time. The rest of the fleet is aging badly, but fishermen cannot afford new vessels.261

As in many other areas of Long Island where clams and other shellfish are a significant part of the fishing industry, water quality is a consistent problem in the increasingly populated shallow bays where the clams are dug (New York Seafood Council n.d.) The bays have had several problems with algal blooms of *Aureococcus anophagefferens*, or brown tide, which killed off bay scallop populations here, and is believed to be related to nutrient depletion in the bay (Oles 2005).

Shinnecock Inlet needs to be dredged consistently because of siltation to allow commercial fishermen and recreational vessels to pass in and out of the inlet into the Atlantic Ocean, which is a costly process (Oles 2005). The Long Island Power Authority is seeking permission to construct a wind farm off Long Island, a proposal which has met with opposition from commercial fishermen in Hampton Bays and elsewhere on the island, because the turbines will block access to a highly productive squid fishery (Anonymous 2005).

Cultural attributes

Sportfishing tournaments are a popular event in this area (Shinnecock Marlin and Tuna Club 2007).

260 Personal Communication, Erik Braun, NMFS port agent, E. Hampton, NY, July 22, 2005
261 Personal Communication, Erik Braun, NMFS port agent, E. Hampton, NY, July 22, 2005

Infrastructure

Current Economy

The largest employer in Southampton Town is Southampton Hospital, which employs over 100 people. Other significant sources of employment for residents are in businesses related to tourism or the second home industry, including landscaping, pool maintenance, and construction.262

Many employers in the fishing industry have noted the difficulty in attracting employees here when many can make more money in the landscaping business, which has a high demand for laborers, particularly from April through November (Oles 2005). Port Agent Erik Braun said there has been an influx of Hispanic dock workers, and many of the fishermen have had to learn Spanish to communicate with them. This has been a dramatic change within the last 5 years, he said. He also stated that there are no new fishermen starting up, and the children of fishermen, even those that are doing well, are not encouraged to enter into this business.263

According to the U.S. Census 2000264, 60.6% (6028 individuals) of the total population 16 years of age and over were in the labor force, of which 3.4% were unemployed, 0.3% were in the Armed Forces, and 57.0% were employed (Figure 4).

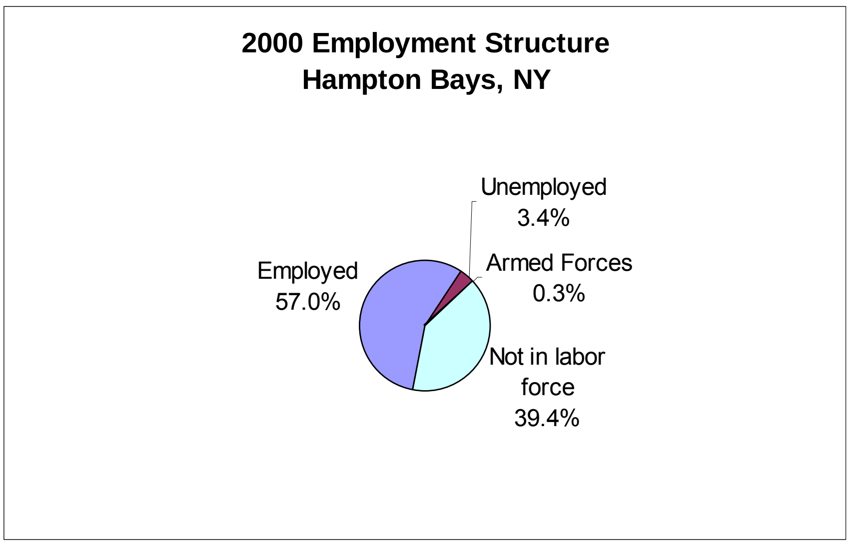


Figure 4. Employment Structure in 2000 (US Census Bureau 2000)

According to Census 2000 data, jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 95 positions or 1.7% of all jobs. Self employed workers, a category where fishermen might be found, accounted for 789 positions or 13.9% of jobs. Educational, health and social services (20.3%), construction (18.9%), and retail trade (14.4%) were the primary industries.

Median household income in Hampton Bays in 2000 was $50,161 (up 40.0% from $35,736 in 1990 [US Census Bureau 1990]) and per capita income was $27,027. For full-time year round workers, men made approximately 56.6% more per year than women.

The average family in Hampton Bays consisted of 3.0 persons. With respect to poverty, 6.7% of families (up from 2.4% in 1990 [US Census Bureau 1990]) and 10.7% of individuals were below the U.S. Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families,

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262 Personal communication, Southampton Town Chamber of Commerce, 76 Main St., Southampton, Long Island, NY 11968, 7/13/05

263 Personal Communication, Erik Braun, NMFS port agent, E. Hampton, NY, July 22, 2005

264 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

depending on number of persons (2-9) (US Census Bureau 2000b). In 2000, 23.2% of families in 2000 earned less than $35,000 per year.

In 2000, Hampton Bays had a total of 6,881 housing units of which 70.9% were occupied and 86.3% were detached one unit homes. Less than ten percent (7.1%) of these homes were built before 1940. Mobile homes accounted for 1.7% of the total housing units; 93.9% of detached units had between 2 and 9 rooms. In 2000, the median cost for a home in this area was $178,000. Of vacant housing units, 84.3% were used for seasonal, recreational, or occasional use. Of occupied units 29.8% were renter occupied.

Government

A 5-person Town Board governs the town of Southampton. There is 1 supervisor, elected to a 2-year term, and the rest of the board is elected to staggered 4-year terms (Town of Southampton nd).

Fishery involvement in the government

In addition to the Town Board, the town of Southampton has a Board of Trustees made up of five elected members, which is responsible for governing the laws of the waters and bay bottoms. Their jurisdiction includes boating activities, shellfishing licenses, shoreline protection, and docks and other marine infrastructure. The laws of the Board of Trustees are enforced by the Bay Constables (Town of Southampton nd).

Institutional

Fishing associations

The New York Seafood Council, located in Hampton Bays, is the largest association representing fishing interests in the state. "The New York Seafood Council (NYSC) is an industry membership organization comprised of individuals, businesses, or organizations involved in the harvesting, processing, wholesale, distribution or sale of seafood products or services to the seafood industry in New York." (NYSC 2008) The Southampton Town Baymen's Association serves the interests of the inshore watermen utilizing Shinnecock Bay and the other bays within the town of Southampton. Also relevant to this area is the Long Island Commercial Fishing Association, which promotes commercial fishing throughout Long Island (Oles 2005). The Shinnecock Co-op dock was in operation for 30 years, but went bankrupt and closed two years ago.265 There was also an organization called the Concerned Wives of Shinnecock Fishermen, that ceased to exist about 15 years ago.266

Fishery assistance centers

Information on fishery assistance centers in Hampton Bays was unavailable through secondary data collection.

Other fishing related organizations

The Shinnecock Marlin and Tuna Club is a recreational fishing club that sponsors tournaments. They also represent the interests of sportfishermen at meetings and fight for the improvement of Shinnecock Inlet and the preservation of local waters (Shinnecock Marlin and Tuna Club 2007).

Physical

Hampton Bays is strategically positioned on Shinnecock Bay, protected from the Atlantic by a barrier island and accessed through Shinnecock Inlet. This allows fishermen access to both productive coastal and offshore fishing, and its proximity to markets in New York City is also important (NYSC 2008). It is roughly 30 miles from

265 Personal Communication, Erik Braun, NMFS port agent, E. Hampton, NY, July 22, 2005
266 Personal Communication, Erik Braun, NMFS port agent, E. Hampton, NY, July 22, 2005

Montauk, NY on the eastern tip of Long Island, and about 90 miles from New York City (NYSC 2008). The Francis Gabreski Airport in Westhampton Beach is 10 miles away, Long Island Islip MacArthur Airport is 36 miles away, and JFK International Airport is 77 miles from Hampton Bays (MapQuest 2005). The Long Island Railroad stops in Hampton Bays and travels directly into New York City. Roughly 80% of the finfish landed in Hampton Bays/Shinnecock is sold at Fulton's Fish Market in New York City (NYSC 2008).

The commercial fishing industry for Hampton Bays/Shinnecock is located on a thin strip of sand on the barrier island by Shinnecock Inlet, allowing the vessels to easily pass out of the Inlet into the sea, physically isolated from the rest of the town. Until recently (2005), there were three docks in Shinnecock including the Shinnecock Fish Dock, the fishermen's cooperative dock, which provided labor, ice, boxes, and trucking for its members, as well as low-cost fuel, and one private dock (Oles 2005). These docks are still present, but only the private dock is still operating and packing out fish. The other docks are abandoned; vessels still tie up to them but cannot receive any services. The cooperative dock has been turned into a restaurant.267

The majority of marinas and other infrastructure for recreational fishing as well as recreational boating within the town of Southampton are located in the Hampton Bays area alongside the Shinnecock Canal (Town of Southampton nd). The Shinnecock Canal County Marina is a publicly-owned marina along the canal (Town of Southampton n.d.), but it does not allow commercial vessels to tie up here (Oles 2005). There are at least two bait and tackle shops located in Hampton Bays, and several others within Southampton. There are also six fish retail markets located in Hampton Bays (NYSC 2008).

Involvement in Northeast Fisheries268

Commercial

Both landings data and vessel data have been combined for Hampton Bays/ Shinnecock for this profile because the fishing communities are indistinguishable. Hampton Bays/ Shinnecock is generally considered the second largest fishing port in New York after Montauk. The combined ports of Hampton Bays/Shinnecock had more landings of fish and shellfish in 1994 than at any other commercial fishing port in New York. Combined landings of surf clams and ocean quahogs were worth roughly $1.6 million in 1994, and squid was at the time the most valuable species here (NYSC 2008). A 1996 report from the New York Seafood Council listed the following vessels for the combined port of Hampton Bays/Shinnecock: 30-35 trawlers, 2-8 clam dredge vessels, 1-2 longline vessels, 1-3 lobster boats, 4-5 gillnetters, as well as 10-15 fulltime baymen and at least 100 part-time baymen (NYSC nd). As of 2005, there was one longline vessel here and many of the trawlers were gone.269

Hampton Bays/Shinnecock had at one time a significant surf clam and ocean quahog fishery, evident in the 1997 data, which by 2006 had completely disappeared (Table 1**Error! Reference source not found.**). Oles notes that surf clam and ocean quahog landings in the past had been from transient vessels landing their catch here (Oles 2005). The level of home port fishing declined over the period from 1997 – 2004 for vessels listed with either Hampton Bays or Shinnecock as their home port, but increased slightly in 2005 and 2006 (Table 2Table). Shinnecock/Hampton Bays saw the highest landings in the squid, mackerel, butterfish grouping on average for 1997-2006, at just over $2.5 million. Landings in 2006 were less than the average value, at just over $2 million.

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267 Personal Communication, Erik Braun, NMFS port agent, E. Hampton, NY, July 22, 2005

268 In reviewing the commercial landings data several factors need to be kept in mind. 1) While both federal and state landings are included, some states provide more detailed data to NMFS than others. For example, shellfish may not be included or data may be reported only by county and not by port. 2) Some communities did not have individual port codes until more recently. Before individual port codes were assigned, landings from those ports were coded at the county level or as an aggregate of two geographically close small ports. Where landings were coded at the county level they cannot be sorted to individual ports for those earlier years, e.g., prior to 2000. 3) Where aggregated codes were used, those aggregate codes may still exist and be in use alongside the new individual codes. Here the landings which are still assigned to the aggregate port code cannot be sorted into the individual ports, so port level data are only those which used the individual port code. 4) Even when individual port codes exist, especially for small ports, landings may be coded at the county level. Here again it is impossible to disaggregate these to a port level, making the port level landings incomplete. 5) In all these cases, the per port data in this profile may under report the total level of landings to the port, though all landings are accounted for in the overall NMFS database.

269 Personal Communication, Erik Braun, NMFS port agent, E. Hampton, NY, July 22, 2005

Landings of smallmesh groundfish, another important species grouping, were considerably lower in 2006 than the ten year average value. However, landings of the summer flounder, scup, and black sea bass grouping had increased in 2006, and landings of "other" species and scallops were both considerably higher in 2006 than the average values. Generally, the level of landings in Hampton Bays/Shinnecock was much higher than the home port values. Landings declined from a high of close to $10 million in 1997 down to $6.5 million in 2002-2004, increasing again to $8 million in 2005 and 2006. In 2007 Hampton Bays/Shinnecock was 11th out of the15 ports landing 100,000lbs or more of skate.

Speaking of Long Island in general NMFS Port Agent Victor Vecchio noted that maybe 10-15% of skates landed come in on monkfish gillnetters, with the about 80% coming off trawlers, and the remainder coming from pound nets (which are still popular on Long Island – inshore state fishery). "Every dragger has 3-5 baskets of skates."270

Hampton Bays/Shinnecock has the highest number of skate dealers in the Northeast Region (20) in 2007, but Vecchio notes that they are almost exclusively vessels which have a dealer license so they can sell directly to local pot fishermen, rather than the sort of separate dealer found in many other areas of the Northeast.271

The number of vessels home ported in Hampton Bays/Shinnecock generally declined, from 65 in 1997 to 49 in 2003, increasing again to 54 in 2006. In 2007 Hampton bays/Shinnecock was 12th in terms of homeport and 10th in terms of owner's town of residence out of the 12 ports having at least 2% of all skate permits.

There are a number of baymen who work in Shinnecock Bay, through permits granted by the town of Southampton, fishing for eels, conch, razor clams, scallops, and oysters, among other species (Oles 2005). The Shinnecock Indians had an aquaculture facility for cultivating oysters in the bay, but the oyster beds were largely destroyed through pollution and nutrient-loading; they are once again starting to recreate the oyster beds (DCR 2004).

Landings by Species

Table 1. Dollar value by Federally Managed Groups of landings for Hampton Bays/Shinnecock

HAMPTON BAYS / SHINNECOCK	Average from 1997-2006	2006 only
Squid, Mackerel, Butterfish	2,524,001	2,039,202
Summer Flounder, Scup, Black Sea Bass	1,228,520	1,322,108
Smallmesh Groundfish272	1,061,915	289,561
Other273	934,568	1,525,033
Monkfish	640,566	651,960
Scallop	478,525	1,227,794
Largemesh Groundfish274	473,771	271,480
Tilefish	468,683	377,301
Bluefish	216,681	241,080
Skate	71,269	59,764
Surf Clams, Ocean Quahog	56,708	0
Dogfish	48,407	498
Lobster	25,638	17,937
Herring	393	1,738

270 Pers. com. Victor Vecchio, NMFS Port Agent in Montauk, NY, October 31, 2008.
271 Pers. com. Victor Vecchio, NMFS Port Agent in Montauk, NY, October 31, 2008.
272 Smallmesh Multi-Species: red hake, ocean pout, mixed hake, black whiting, silver hake (whiting)
273 "Other" species includes any species not accounted for in a federally managed group
274 Largemesh Groundfish: cod, winter flounder, yellowtail flounder, American plaice, sand-dab flounder, haddock, white hake, redfish, and pollock

Vessels by Year[275]

Table 2. All columns represent vessel permits or landings value combined between 1997-2006

Year	# Vessels (home ported)	# Vessels (owner's city)	Level of fishing home port ($)	Level of fishing landed port ($)
1997	65	38	8,195,598	9,754,671
1998	60	30	8,040,050	9,671,692
1999	58	32	9,172,792	8,445,374
2000	58	31	8,361,761	9,472,731
2001	57	36	7,598,408	9,221,483
2002	51	35	6,996,831	6,528,459
2003	49	33	5,291,436	6,528,459
2004	51	32	4,412,092	6,590,465
2005	50	37	4,866,267	8,057,658
2006	54	42	4,930,913	8,025,456

 # Vessels home ported = No. of permitted vessels with location as homeport
 # Vessels (owner's city) = No. of permitted vessels with location as owner residence[276]
Level of fishing home port ($) = Landed value of fisheries associated with home ported vessels
Level of fishing landed port ($) = Landed value of fisheries landed in location

Recreational

Recreational fishing is an important part of the tourist industry in Hampton Bays. The marinas here are well positioned for both inshore fishing in Shinnecock Bay and offshore fishing, and there are numerous charter and party boats that go fishing in both areas (Association of Marine Industries 1998). Many of those who own second homes in Southampton also own private boats for recreational fishing, and this contributed substantially to the marinas and other marine industries (Oles 2005). A website dedicated to fishing striped bass (Stripers 247.com) lists a number of locations in Hampton Bays for catching striped bass from on shore. One report estimated the value of recreational fishing at between $32 million and $66.8 million for the town of Southampton, which far exceeds the value of commercial fishing here. Recreational shellfishing is a popular activity in the area; at one time it was estimated that 50 percent of shellfishing in Southampton was done recreationally, both by residents and tourists (Town of Southampton nd).

Subsistence

Oles noted in his report on the Hampton Bays/Shinnecock community (2005) that the recreational fishery has shifted from one focused on bagging as many fish as possible for consumption to one focused on catch-and-release, as many of those fishing in the area can easily afford to buy fish.

FUTURE

The master plan for the Town of Southampton includes a commitment to preserving the town's fisheries by protecting the industry from growth and development pressures, recognizing the importance of fisheries to both the economy and character of the area (Town of Southampton nd). The Master Plan, adopted in 1999, includes a plan to expand the town's commercial fishing dock (Town of Southampton nd).

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275 Numbers of vessels by owner's city and homeport are as reported by the permit holder on permit application forms. These may not correspond to the port where a vessel lands or even spends the majority of its time when docked.

276 The Owner-City from the permit files is technically the address at which the owner receives mail concerning their permitted vessels, which could reflect the actual location of residence, the mailing address as distinct from residence, owner business location, or the address at which a subsidiary receives mail about the permits.

“The resilience of the commercial fishing industry in Hampton Bays is threatened by the cumulative effects of fisheries management and the forces of gentrification that are sweeping the area” (Oles 2005). One potentially positive note for the fishing industry is that the barrier island and beach where the commercial fishing industry is located are owned by Suffolk County and cannot be developed, so there is less direct competition for space here (Oles 2005).

Erik Braun, the port agent for this part of New York, was not hopeful about the future of the fishing industry. He said there are no new fishermen getting into commercial fishing, and that even those who have done well are not encouraging their children to get into the industry. The fleet is badly aging and much of it is in disrepair. Much of the infrastructure here is also gone, and those who own docks can make much more by turning them into restaurants.277

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277 Personal Communication, Erik Braun, NMFS port agent, E. Hampton, NY, July 22, 2005

o. BELFORD (MIDDLETOWN), NJ[278]

Community Profile[279]

People and Places

Regional orientation

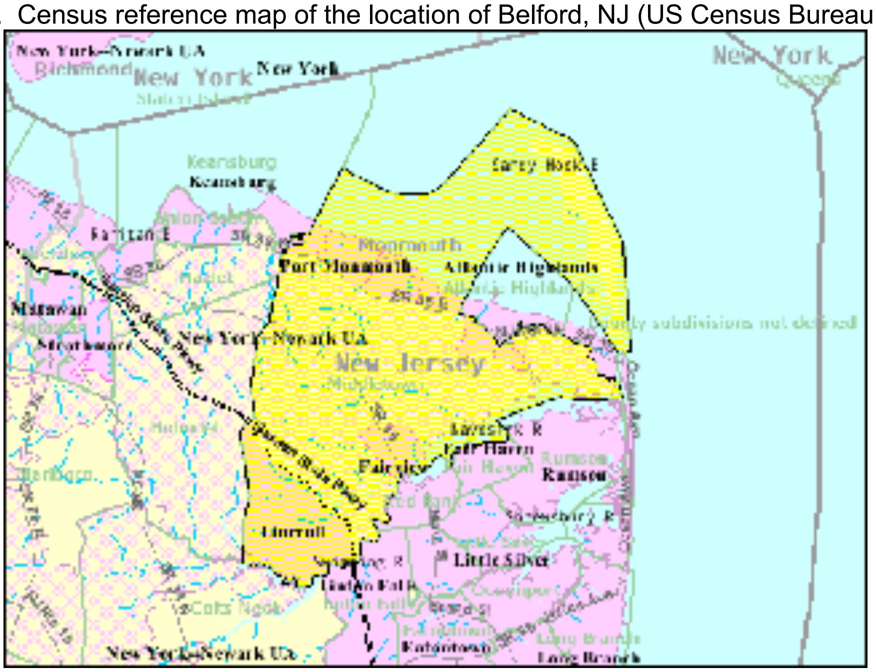
The community of Belford, New Jersey (40.42° N, 74.09°W) is located on the Bayshore in the township of Middletown, in Monmouth County. Middletown is bordered by Raritan Bay/Sandy Hook Bay in the north and the Navesink River to the southeast (McCay et al. 2005). Belford lies along Sandy Hook Bay (part of the Raritan Bay complex), and occupies 1.3 square miles of land (USGS 2008; see Maps 1 and 2) While most fishing activity takes place in Belford, some of the surrounding communities within Middletown also play a role in the fishery.

Historical/Background information

Fishing has been a long tradition in this area; the Lenni Lenape Indians fished in the bay here before white settlers arrived and the Dutch were fishing here in the 1600s (Jones 2004). Belford is part of the township of Middletown, which was first established as a township in 1664 (McCay et al. 2005). Middletown has 14 distinct villages, of which four, North Middletown, Port Monmouth, Belford, and Leonardo, lie along the Bayshore (McCay et al. 2005). The area known today as Belford, along with what is now Port Monmouth, was originally known as Shoal Harbor. Shoal Harbor was relatively isolated until the mid-1800s when the construction of a road here as well as a nearby railroad opened this area up allowing farmers and fishermen to sell their wares in New York City and other areas (Jones 2004). Belford was officially established in 1891 when a rail station was built here, separating from Port Monmouth (Township of Middletown nd). A menhaden processing plant was built in Belford in the late 1800s, which operated until 1982 (Jones 2004); this was once the town's largest employer (Township of Middletown nd). The presence and stench of the menhaden plant helped maintain Belford as a relatively unchanged fishing port while the rest of the shore around it was subject to intense development and tourism. Belford has notoriously been home to pirates, blockaders, rum runners, and even through the 1980s, fish poachers. There is a long tradition among some Belford fishermen of not obeying fisheries regulations (Jones 2004). Some consider Belford to be the longest continuously operating fishing village on the East Coast.

278 These community profiles have been created to serve as port descriptions in Environmental Impact Statements (EISs) for fisheries management actions. They also provide baseline information from which to begin research for Social Impact Assessments (SIAs). Further, they provide information relevant to general community impacts for National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and information on minorities and low income populations for Executive Order (E.O.) 12898 on Environmental Justice.
279 For purposes of citation please use the following template: "Community Profile of *Town, ST*. Prepared under the auspices of the National Marine Fisheries Service, Northeast Fisheries Science Center. For further information contact Lisa.L.Colburn@noaa.gov."

Map 1. Census reference map of the location of Belford, NJ (US Census Bureau 2000)



Map 2. Census reference map of the location of Middletown, NJ

Demographics[280]

Belford CDP

According to Census 2000 data, Belford had a total population of 1,340[281]; 1990 population data was unavailable for Belford for comparison. Of this total in 2000, 50.4% were female and 49.6% were male. The median age was 35.8 years and 69.6% of the population was 21 years or older while 11.8% were 62 or older.

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280 While mid-term estimates are available for some larger communities, data from the 2000 Census are the only data universally available for the communities being profiled in the Northeast. Thus for cross-comparability we have used 2000 data even though these data may have changed significantly since 2000 for at least some communities.

The population structure for Belford indicates that this is a community of young families. The largest percentages of residents were between 30-39 and 40-49 years of age (Figure 1). There were also a large number of children between the ages of 0-9, and a significant decline in the number of residents over the age of 60. Like many fishing communities, Belford's population showed a dip in the number of residents between the ages of 20-29 and even in the 10-19 age bracket, as young people left to go to school or in search of jobs. This is more prevalent for males than for females for the 20-29 age bracket.

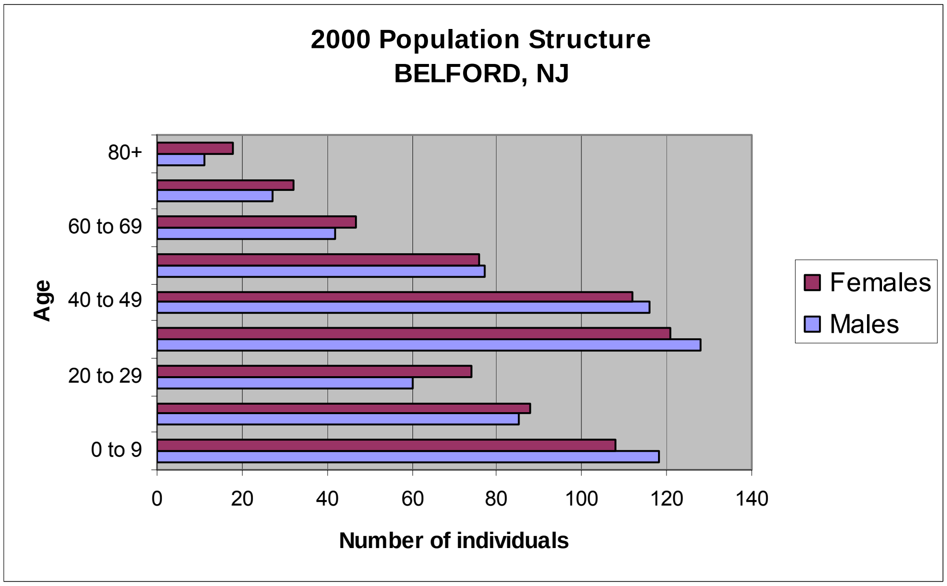
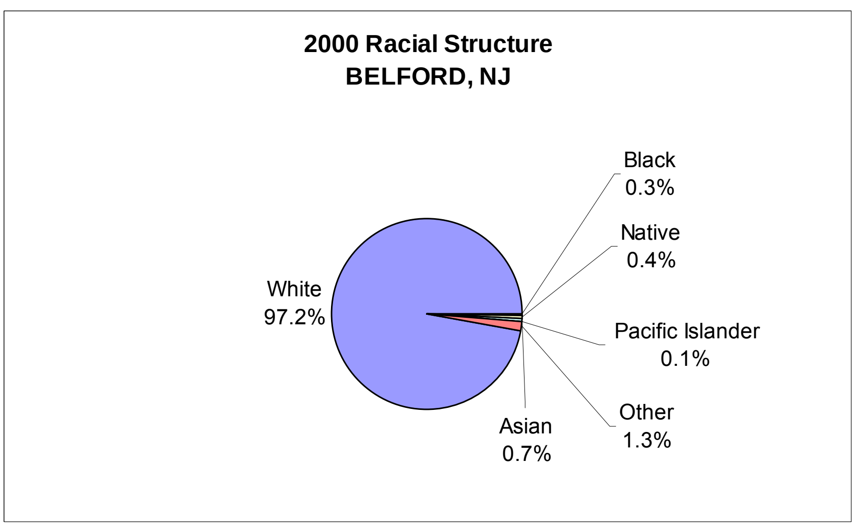


Figure 1. Population structure by sex in 2000 (US Census Bureau 2000)

The majority of the population of Belford in 2000 was white (97.2%), with 0.3% of residents black or African American, 0.4% Native American, 0.7% Asian, and 0.1% of residents listed as Pacific Islander or Hawaiian (Figure 2). Only 4.7% of the total population identified themselves as Hispanic/Latino (Figure 3). Residents linked their heritage to a number of different ancestries including: Irish (44.0%), Italian (38.2%) German (23.6%), and Polish (8.6%). With regard to region of birth, 63.2% were born in New Jersey, 32.3% were born in a different state and 2.7% were born outside of the U.S. (including 0.4% who were not United States citizens).



281 These and all census data, unless otherwise referenced, can be found at http://factfinder.census.gov/home/saff/main.html; census data used are for Belford CDP

Figure 2. Racial Structure in 2000 (US Census Bureau 2000)

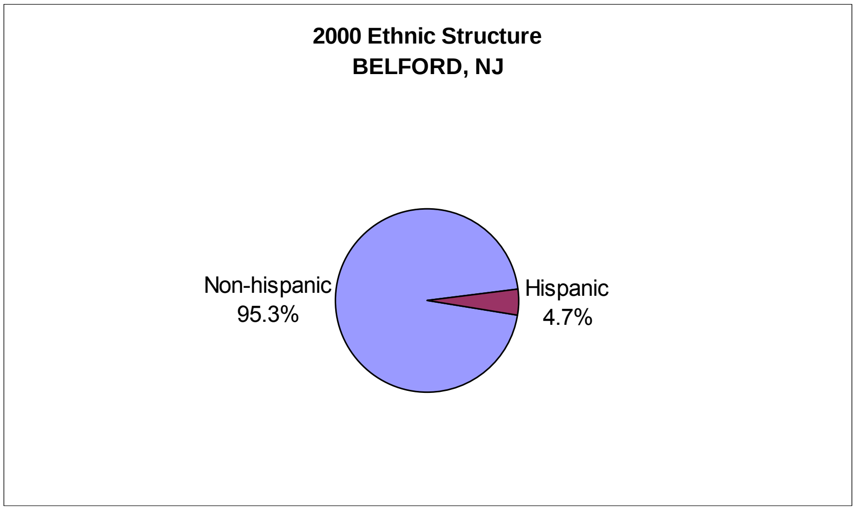


Figure 3. Ethnic Structure in 2000 (US Census Bureau)

For 90.0% of the population 5 years old and higher in 2000, only English was spoken in the home, leaving 10.0% in homes where a language other than English was spoken, and including 3.0% of the population who spoke English less than "very well."

Of the population 25 years and over, 89.7% were high school graduates or higher and 16.8% had a bachelor's degree or higher. Again of the population 25 years and over, 1.0% did not reach ninth grade, 9.3% attended some high school but did not graduate, 41.6% completed high school, 24.3% had some college with no degree, 7.0% received their associate's degree, 13.3% earned their bachelor's degree, and 3.4% received either a graduate or professional degree.

Middletown

According to Census 2000 data, Middletown township had a total population of 66,327, down 2.7% from 1990. Of this total in 2000, 51.4% were female and 48.6% were male. The median age was 38.8 years and 70.8% of the population was 21 years or older while 15.0% were 62 or older.

The population structure for Middletown indicates that this is a community of young families. The largest percentages of residents are between 40-49 years and 30-39 years of age. There are also a large number of children between the ages of 0-19, and a significant decline in the number of residents over the age of 60 (Figure 4). Like many communities, Middletown's population has a dip in the number of residents between the ages of 20-29, as young people leave to go to school or in search of jobs.

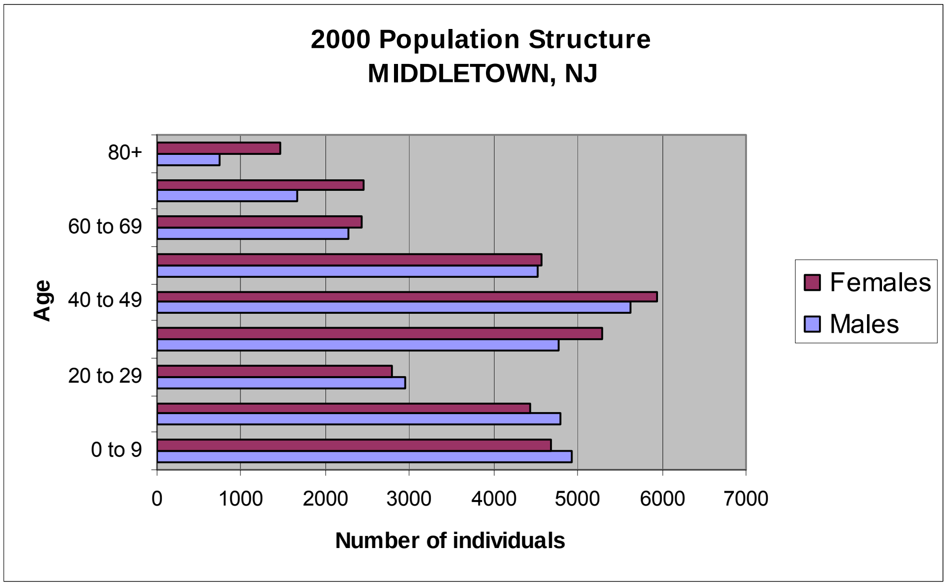


Figure 4. Population structure by sex in 2000 (US Census Bureau 2000)

The majority of the population of Middletown in 2000 was white (94.6%), with 1.4% of residents Black or African American, 0.2% Native American, 2.9% Asian, and 0.1% of residents listed as Pacific Islander or Hawaiian (see Figure 5). Only 3.4% of the total population identified themselves as Hispanic/Latino (see Figure 6). Residents linked their heritage to a number of different ancestries including: Irish (32.9%), Italian (28.9%), German (17.4%), English (8.8%), and Polish (8.7%). With regard to region of birth, 58.7% were born in New Jersey, 34.1% were born in a different state and 6.4% were born outside of the U.S. (including 2.5% who were not United States citizens).

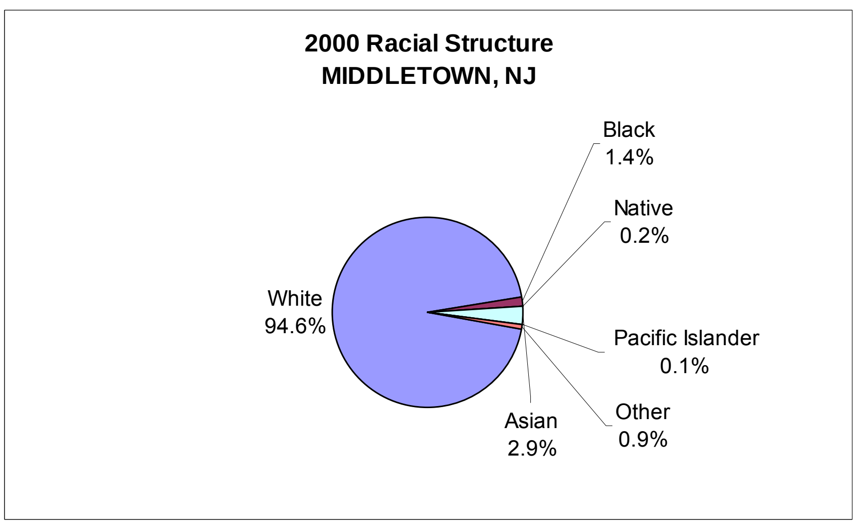


Figure 5. Racial Structure in 2000 (US Census Bureau 2000)

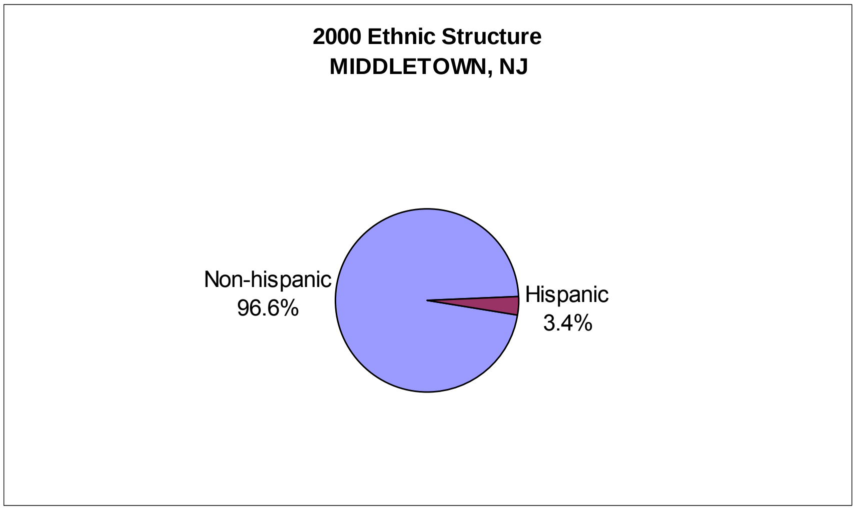


Figure 6. Ethnic Structure in 2000 (US Census Bureau 2000)

For 91.1% of the population 5 years old and higher in 2000, only English was spoken in the home, leaving 8.9% in homes where a language other than English was spoken, and including 2.3% of the population who spoke English less than "very well."

Of the population 25 years and over, 90.7% were high school graduates or higher and 35.0% had a bachelor's degree or higher. Again of the population 25 years and over, 2.7% did not reach ninth grade, 6.5% attended some high school but did not graduate, 29.2% completed high school, 19.7% had some college with no degree, 6.9% received their associate's degree, 22.4% earned their bachelor's degree, and 12.6% received either a graduate or professional degree.

Although religious percentages are not available through the U.S. Census, according to the American Religion Data Archive (ARDA) in 2000 the religion with the highest number of congregations and adherents in Monmouth County was Catholic with 50 congregations and 289,183 adherents. Other prominent congregations in the county were Jewish (42 with 65,000 adherents), United Methodist (47 with 12,992 adherents), and Muslim (5 with 9,455 adherents). The total number of adherents to any religion increased 38.9% from 1990 to 2000 (ARDA 2000).

Issues/Processes

The promised clam depuration plant and renovation of the cooperative and other fishing infrastructure in Belford, which may be of great benefit to the fishing community here, have been continuously postponed, and fishermen are concerned that condominiums will be built on the property instead. The project was being headed by the Bayshore Economic Development Corporation, which later became surrounded with controversy and had some of its state funding cut off.

As Belford becomes more accessible to commuters to New York City and elsewhere, and as housing is increasingly scarce around the city, many people are moving to Belford and forcing up the price of homes. The resulting increase in property taxes may force some residents who have lived in Belford their entire lives to relocate (Jones 2004). Belford represents some of the last untouched waterfront real estate in New Jersey within commuting distance to New Jersey, and development pressures here are increasing (NJEDA nd).

There is frequently conflict between menhaden purse seine vessels from Belford and recreational fishermen, who criticize the vessels for catching large amounts of oysters and sport fish species along with the menhaden. For this and other reasons, there is frequently animosity between recreational and commercial fishermen (Jones 2004).

Cultural attributes

The site of the Belford Fisherman's Co-op has an interpretive exhibit about the commercial fishing industry here (NPS nd). Monmouth County wishes to promote the co-op as a regional tourist attraction (van Develde 2003).

The Leonardo Party and Pleasure Boatman's Association hosts fishing tournaments out of the Leonardo State Marina.

Infrastructure

Current Economy

The largest employers in the township of Middletown are the following: AT&T (3,300+ employees; (McCay et al. 2005), Food Circus Supermarkets, Inc. (1,263 employees), Brookdale Community College (737 employees), and T&M Associates (engineering - 200 employees). There are many other large employers throughout Monmouth County where Middletown residents are likely to be employed (Monmouth County nd). Additionally, many of Middletown's residents commute to work in New York City (McCay et al. 2005).

Belford CDP

According to the U.S. Census 2000282, 76.4% (799 individuals) of the total population 16 years of age and over were in the labor force, of which 2.2% were unemployed, 1.1% were in the Armed Forces, and 71.3% were employed (see Figure 7).

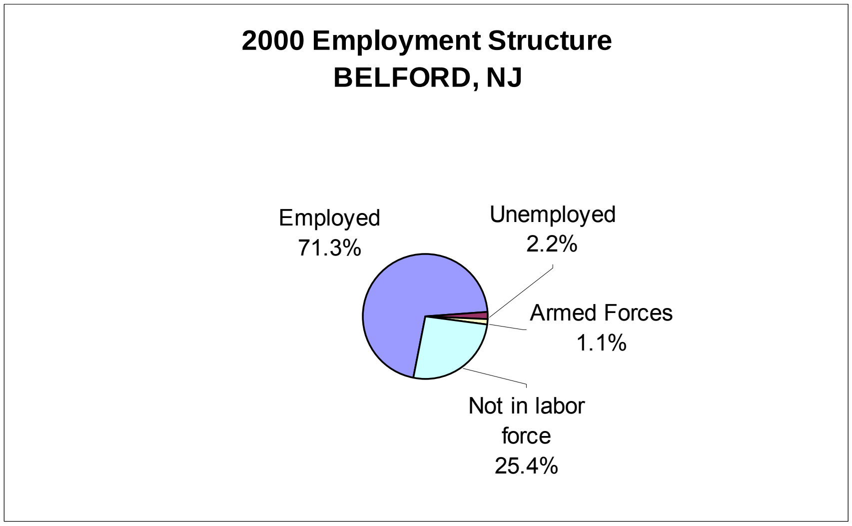


Figure 7. Employment Structure in 2000 (US Census Bureau 2000)

According to Census 2000 data, in Belford jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 17 positions or 2.3% of all jobs. Self employed workers, a category where fishermen might be found, accounted for 46 positions or 6.2% of jobs. Construction (17.5%), educational, health, and social services (16.5%), professional, scientific, management, administrative, and waste management services (12.8%), and manufacturing (8.9%) were the primary industries.

Median household income in Belford in 2000 was $66,964 (1990 population data was unavailable for Belford) and per capita income was $25,412. For full-time year round workers, men made approximately 47.9% more per year than women.

The average family in Belford consisted of 3.29 persons. With respect to poverty, 1.3% of families (1990 population data was unavailable for Belford) and 3.2% of individuals were below the U.S. Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families, depending on number of persons (2-9) (US Census Bureau 2000b). In 2000, 14.4% of all families of any size earned less than $35,000 per year.

In 2000, Belford had a total of 548 housing units, of which 95.2% were occupied and 94.2% were detached one unit homes. More than one-third (35.9%) of these homes were built before 1940. No mobile homes, boats, RVs, vans, etc. were found for Belford; 96.4% of detached units had between 2 and 9 rooms. In 2000, the median

282 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

cost for a home in this area was $146,000. Of vacant housing units, 4.5% were used for seasonal, recreational, or occasional use, while of occupied units 13.5% were renter occupied.

Middletown

According to the U.S. Census 2000283, 66.4% (33,789 individuals) of the total population 16 years of age and over were in the labor force, of which 2.2% were unemployed, 0.1% were in the Armed Forces, and 64.1% were employed (see Figure 8).

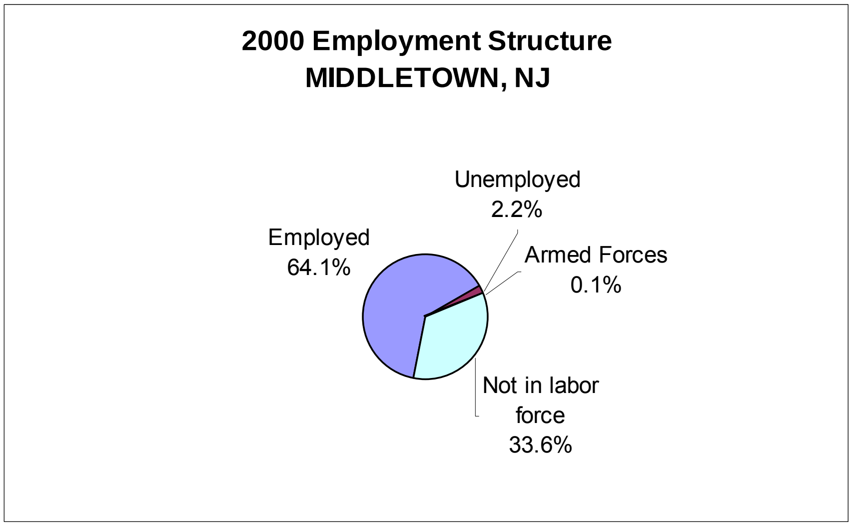


Figure 8. Employment Structure in 2000

According to Census 2000 data, jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 95 positions or 0.3% of all jobs. Self employed workers, a category where fishermen might be found, accounted for 1,587 positions or 4.9 % of jobs. Educational, health, and social services (18.6%), finance, insurance, real estate, and rental and leasing (13.4%), professional, scientific, management, administrative, and waste management services (12.6%), and retail (12.0%) were the primary industries.

Median household income in Middletown in 2000 was $75,566 (up 38.6% from $54,503 in 1990 [US Census Bureau 1990]) and per capita income was $34,196. For full-time year round workers, men made approximately 67.7% more per year than women.

The average family in Middletown consisted of 3.27 persons. With respect to poverty, 1.9% of families (similar to 1.8% in 1990 [US Census Bureau 1990]) and 3.1% of individuals were below the U.S. Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families, depending on number of persons (2-9) (US Census Bureau 2000b). In 2000, 11.3% of all families of any size earned less than $35,000 per year.

In 2000, Middletown had a total of 23,841 housing units, of which 97.5% were occupied and 80.6% were detached one unit homes. Just over ten percent (12.1%) of these homes were built before 1940. Mobile homes, boats, RVs, vans, etc. accounted for 0.1% of housing; 80.0% of detached units had between 2 and 9 rooms. In 2000, the median cost for a home in this area was $210,700. Of vacant housing units, 12.3% were used for seasonal, recreational, or occasional use, while of occupied units 13.6% were renter occupied.

Governmental

Middletown is governed by a five-member township committee, which includes the mayor, who is designated for one year by the other members. Each committee member serves a three-year term. Belford is one of about a dozen villages within the township of Middletown (Township of Middletown nd).

283 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

Fisheries involvement in government

In 2006 the Town of Middletown was awarded a $75,000 Smart Future planning grant from the state to study ways to improve the economic vitality of the fishing industry in Belford (Anon 2006).

Institutional

Fishing associations

"Belford is believed to have the oldest continually operating fishing cooperative on the east coast. It was founded in 1953… The Belford Seafood Cooperative handles members' catches, purchases fish from non-members, arranges for the sale and transportation of the fish, and leases a lot of the docks to the fishermen" (Jones 2004).

Garden State Seafood Association in Trenton is a statewide organization of commercial fishermen and fishing companies, related businesses and individuals working in common cause to promote the interests of the commercial fishing industry and seafood consumers in New Jersey.

The Jersey Coast Anglers Association (JCAA) is an association of over 75 saltwater fishing clubs throughout the state. Founded in 1981, the purpose of the organization is to unite and represent marine sport anglers to work towards common goals. The JCAA website (www.jcaa.org) also provides links for many NJ anglers associations.

Fishery assistance centers

Information on fishery assistance centers in Middletown/Belford was unavailable through secondary data collection.

Other fishing related organizations

The Leonardo Party and Pleasure Boatman's Association hosts fishing tournaments. The NY/NJ Baykeeper is working to protect and preserve the Hudson/Raritan Estuary for the benefit of both natural and human communities. The organization worked unsuccessfully in conjunction with the Belford fishermen in an attempt to prevent the construction of the New York City ferry dock in Belford.

Physical

Belford is located within the shelter of Sandy Hook (NJFishing nd). The Belford Seafood Cooperative "includes the Pirate's Cove Restaurant and retail fish establishments, as well as a net house, the dock, and the boats. There is also a wholesale and retail lobster facility nearby called Shoal Harbor Lobster. The co-op is on Compton's Creek, which runs directly into Raritan Bay. A relatively new wastewater facility and a brand-new ferry terminal share the creek with the fishermen." When the New York City ferry was put into place in Compton Creek, the creek was widened and more bulkheads were put in, providing more docking space for fishing vessels (Jones 2004). The town of Middletown has at least three marinas and a boat ramp. Bayshore Waterfront Park, in Port Monmouth, has a large fishing pier and is home to the Monmouth Cove Marina (McCay et al. 2005). The Leonardo State Marina, located in the village of Leonardo, has 179 berths, a bait and tackle shop, fuel, and a boat ramp. There are both charter and party boats found here (NJDEP nd). There are bait and tackle and other marine-related businesses located along Route 36 in Belford (McCay et al. 2005).

The township of Middletown has a NJ Transit rail station and several NJ transit bus stops. Route 36 runs through Belford, and the Garden State Parkway and Route 35 run through Middletown (McCay et al. 2005). Belford is about 30 miles from Point Pleasant, 35 miles from Newark, and about 44 miles from New York City. The nearest airport is Newark Liberty International Airport. In 2002 ferry service between Belford and Pier 11 in Manhattan began operation. There are 500 parking spaces available at the Belford Ferry terminal. The commute takes about 40 minutes.

Involvement in Northeast Fisheries[284]

Commercial

Belford is listed as one of the six major commercial fishing ports in the state of New Jersey (NJDA nd). Belford has a tradition of fishing for menhaden that dates back to the 1800s, when a processing plant was constructed here. Although the plant is no longer in existence, today menhaden are still pursued from Belford with trawlers fitted with purse seines (Jones 2004). Menhaden have experienced a resurgence recently (2006), primarily for use as bait (NJ Fishing nd). The commercial fishing activity is based out of Compton Creek. Commercial catches all go through the Belford Seafood Cooperative, which sells most of its product to Fulton Fish Market and to other markets along the East Coast. There are about 20-30 vessels associated with the Co-op, including about 14-15 draggers, about 12 lobster boats, and a number of crabbing boats. There are about 40 vessels in total located in Belford. Much of the fishing here is done less than a mile from shore; this is primarily a baymen's port. Shoal Harbor Lobster, also located in Belford, is an independent wholesaler; the lobsters sold here come from many different places (Jones 2004). They provide all lobsters sold in A&P Supermarkets in New Jersey and Long Island (Peet 2001). Shoal Harbor sells some lobsters from local vessels; they used to have their own boats but they sold them. There are 4 employees at this business.[285]

While some landings and vessel data are listed for Middletown, the majority are listed for Belford, and they have been combined in this profile. The number of vessels listed for Belford is relatively consistent, with a high of 39 in 2004 (see Table 2). The number of home ported vessels was higher in all years than the number of vessels with owners living in Belford/ Middletown, indicating that some vessel owners live in other communities. On average for 1997-2006, the most valuable species grouping in Belford was summer flounder, scup, and black sea bass, followed by the "other" species grouping (see Table 1). For both the 2006 landings values were higher than the 1997-2006 average landings. Most years saw few if any landings listed for Middletown. In 2007 Belford ranked 14th out of 15 ports which landed at least 100,000lbs of skate. Relatively few skate permits in 2007 listed Belford as homeport (1%) or owner's town of residence (0.3%). There are 3 skate dealers listed for Belford. There is also a mixed monkfish/skate fishery off northern New Jersey, near Point Pleasant.

Landings by Species

Table 1. Rank Value of Landings for Federally Managed Groups

BELFORD/MIDDLETOWN	Rank Value of Average Landings from 1997-2006
Summer Flounder, Scup, Black Sea Bass	1
Other[286]	2
Lobster	3

284 In reviewing the commercial landings data several factors need to be kept in mind. 1) While both federal and state landings are included, some states provide more detailed data to NMFS than others. For example, shellfish may not be included or data may be reported only by county and not by port. 2) Some communities did not have individual port codes until more recently. Before individual port codes were assigned, landings from those ports were coded at the county level or as an aggregate of two geographically close small ports. Where landings were coded at the county level they cannot be sorted to individual ports for those earlier years, e.g., prior to 2000. 3) Where aggregated codes were used, those aggregate codes may still exist and be in use alongside the new individual codes. Here the landings which are still assigned to the aggregate port code cannot be sorted into the individual ports, so port level data are only those which used the individual port code. 4) Even when individual port codes exist, especially for small ports, landings may be coded at the county level. Here again it is impossible to disaggregate these to a port level, making the port level landings incomplete. 5) In all these cases, the per port data in this profile may under report the total level of landings to the port, though all landings are accounted for in the overall NMFS database.

285 Shoal Harbor Lobster Company, personal communication, June 28, 2006

286 "Other" species includes any species not accounted for in a federally managed group

BELFORD/MIDDLETOWN	Rank Value of Average Landings from 1997-2006
Largemesh Groundfish287	4
Squid, Mackerel, Butterfish	5
Smallmesh Groundfish288	6
Surf Clams, Ocean Quahog	7
Bluefish	8
Monkfish	9
Dogfish	10
Skate	11
Scallop	12
Herring	13
Tilefish	14

(Note: Only rank value is provided because value information is confidential in ports with fewer than three vessels or fewer than three dealers, or where one dealer predominates in a particular species and would therefore be identifiable.)

Vessels by Year289

Table 21. Federal Vessel Permits Between 1997-2006

Year	# Vessels (home ported)	# Vessels(owner's city)
1997	36	20
1998	31	20
1999	31	19
2000	36	21
2001	36	21
2002	35	21
2003	37	28
2004	39	30
2005	36	27
2006	34	26

(Note: # Vessels home ported = No. of permitted vessels with location as homeport
 # Vessels (owner's city) = No. of permitted vessels with location as owner residence290)

Recreational

Recreational fishing is important to the Bayshore region; there are a number of bait and tackle shops and marinas located here. However, there is little recreational fishing in Belford itself (Jones 2004). Port Monmouth has a fishing pier and marina at Bayshore Waterfront Park (McCay et al. 2005). Leonardo State Marina has a bait and tackle shop as well as both charter and party boats which dock here (NJDEP nd). The Leonardo Party and Pleasure Boatman's Association hosts fishing tournaments out of the Leonardo State Marina.

287 Largemesh groundfish: cod, winter flounder, yellowtail flounder, American plaice, sand-dab flounder, haddock, white hake, redfish, and pollock
288 Smallmesh ulti-species: red hake, ocean pout, mixed hake, black whiting, silver hake (whiting)
289 Numbers of vessels by owner's city and homeport are as reported by the permit holder on permit application forms. These may not correspond to the port where a vessel lands or even spends the majority of its time when docked.
290 The Owner-City from the permit files is technically the address at which the owner receives mail concerning their permitted vessels, which could reflect the actual location of residence, the mailing address as distinct from residence, owner business location, or the address at which a subsidiary receives mail about the permits.

In New Jersey the charter/party fleet is the largest on east coast. Many vessels are over 120 ft long and carry over 150 people.291

Subsistence

Information about subsistence fishing in Belford/Middletown was either unavailable through secondary data collection or the practice does not exist.

FUTURE

The Middletown Master Plan recognizes the importance of Belford as a fishing community and expresses a determination to maintain this character. There is a proposed fishing center for Belford called the Bayshore Technology Center, which would include a research and development facility, a fish farming center, and a clam depuration plant. The goals of the technology center would be to create jobs, promote growth in the Bayshore's commercial fishing industry, and secure the future of the cooperative (Jones 2004). The Bayshore Development Corporation has been working with the Port Authority of New York and New Jersey among others to encourage economic development in the Belford harbor area (McCay et al. 2005). There are also plans in the works to refurbish the cooperative itself (van Develde 2004). These plans have recently been stalled, but the town has just received a grant from the state to begin working on this project itself (Anon 2006). The township and county have been making major infrastructure improvements in and around Belford to roads, bridges, etc. in an effort to revitalize the community and to draw people from elsewhere (Jones 2004).

The community of Belford, despite its proximity to many large urban centers, had been relatively isolated and underdeveloped. However, recently ferry service began between Belford and New York City, and a large upscale condominium development was built, bringing an influx of people to the community. Fishermen anticipate the community will change a great deal. The town has expressed a desire to maintain fishing here, but commercial fishermen perceive this as referring to only recreational fishing activity. There is concern that the new residents won't like the sight and smell of the fisherman's co-op, and the resulting conflict will harm the fishing industry. Many fishermen believe the proposed construction of a clam depuration plant could boost the industry; currently all clams taken from the bay need to be purified to rid them of pollution, and the depuration plants in nearby communities don't have the capacity to take many clams from Belford (Jones 2004).

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van Develde E. 2004. Mid'town seeks funding to improve seafood co-op area. The (NJ) Independent, 2004 Feb 18.

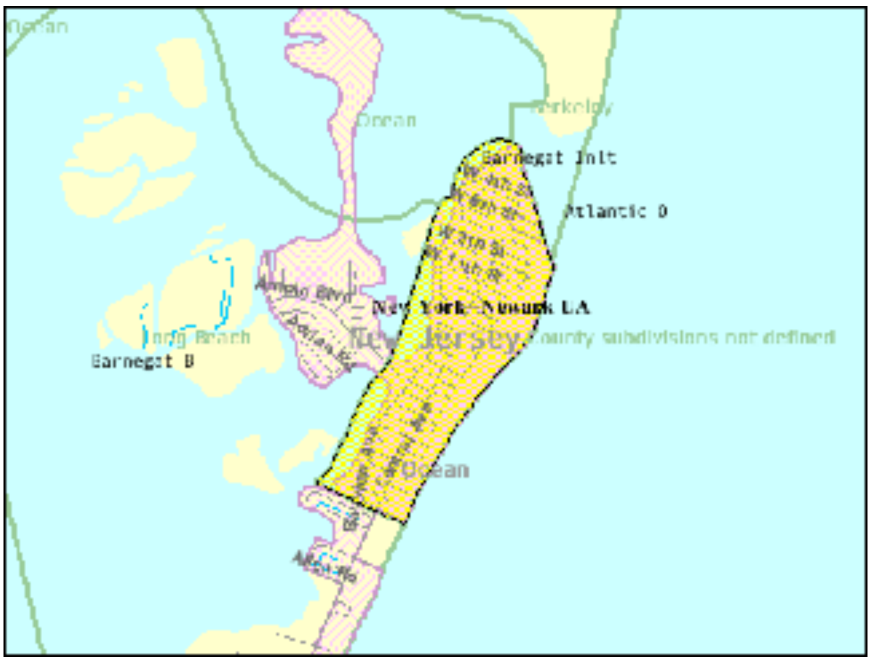
p. LONG BEACH ISLAND/BARNEGAT LIGHT, NJ[292]

Community Profile[293]

People and Places

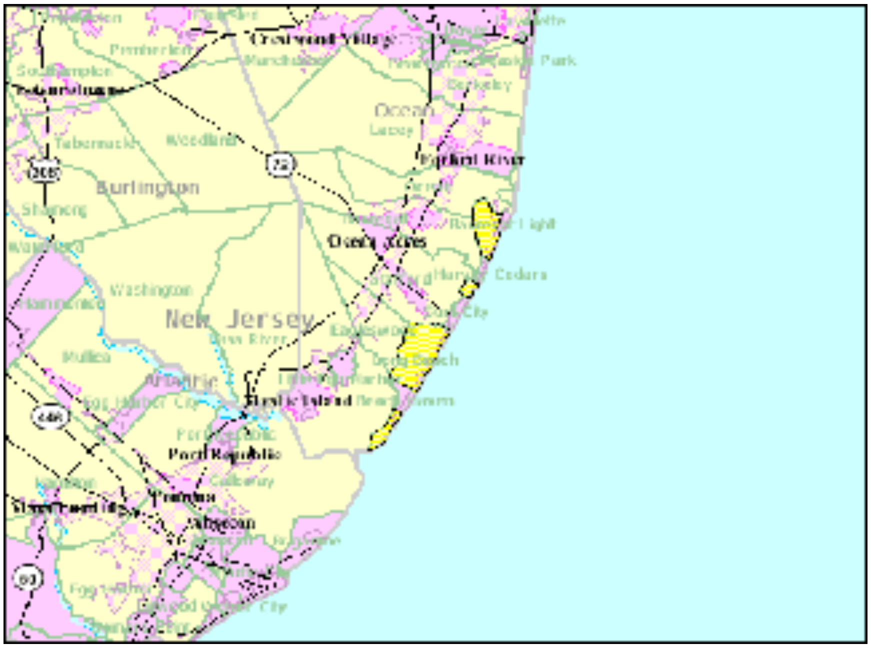
Regional orientation

Long Beach Island is an 18-mile barrier beach on New Jersey's eastern shore, about 4 to 6 miles from mainland New Jersey (LBInet 2008), within Ocean County. It is made up of the Township of Long Beach (39.69° N, 74.14° W), along with five independent boroughs: Barnegat Light, Beach Haven, Harvey Cedars, Ship Bottom, and Surf City. Long Beach Island includes the ports of Barnegat Light and Beach Haven and ports in the surrounding area on the mainland which include Tuckerton, Barnegat, Waretown, and Forked River. The city of Barnegat Light (39.75° N, 74.11° W) is a major commercial port (USGS 2008), while much of the rest of the island specializes in recreational fishing.



Map 1. Location of Barnegat Light, NJ (US Census Bureau 2000)

292 These community profiles have been created to serve as port descriptions in Environmental Impact Statements (EISs) for fisheries management actions. They also provide baseline information from which to begin research for Social Impact Assessments (SIAs). Further, they provide information relevant to general community impacts for National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and information on minorities and low income populations for Executive Order (E.O.) 12898 on Environmental Justice.
293 For purposes of citation please use the following template: "Community Profile of *Town, ST*. Prepared under the auspices of the National Marine Fisheries Service, Northeast Fisheries Science Center. For further information contact Lisa.L.Colburn@noaa.gov."



Map 2. Location of Long Beach, NJ (US Census Bureau 2000)

Historical/Background

The Dutch explorer Captain Cornelius Jacobsen May landed on Long Beach Island in the early 1600s. The island was long known for its many shipwrecks from the strong tides here, so a number of lifesaving stations were constructed along its length, including the Barnegat Light lighthouse. Long Beach Island was at one time an important fishing and whaling center, although it was accessible only by boat. Later it became a hunting and fishing playground for wealthy gentlemen. The island became more accessible in 1886 when a railroad trestle was built connecting it with the mainland. Long Beach Island consists of a number of communities. In 1899 several of these communities were combined into the township of Long Beach; the rest remained as independent boroughs (LBInet 2008).

Barnegat Light is one of the 11 municipalities on Long Beach Island. A small town of less than one square mile in area, it is found at the northern tip of the barrier island. The town is named after the lighthouse located here, which has guided ships along the New Jersey coast for generations.

Until the 1995 construction of a jetty by the Army Corps of Engineers, boats on the other side of the island had to pass through one of several narrow and often dangerous inlets. This difficulty limited the growth of maritime industries along this part of the New Jersey shore, in contrast with the tourism industry, which has taken advantage of the area's numerous sandy beaches. Along with the jetty, the Corps project also produced a three-quarter-mile beach and a fishing pier, further developing the tourist appeal of Barnegat Light. Commercial and recreational fishing have a long tradition in this area, and both industries are still strong today (McCay and Cieri 2000).

Demographics294

Long Beach Township

According to Census 2000 data295, Long Beach township (which encompasses all of Long Beach Island with the exception of the five independent boroughs) had a total population of 3,329, down 3.6% from 3,452 in 1990

294 While mid-term estimates are available for some larger communities, data from the 2000 Census are the only data universally available for the communities being profiled in the Northeast. Thus for cross-comparability we have used 2000 data even though these data may have changed significantly since 2000 for at least some communities.

(US Census Bureau 1990). Of this total in 2000, 52.6% were female and 47.4% were male. The median age was 57.3 years and 86.6% of the population was 21 years or older while 42.7% were 62 or older. The population here can swell to more than 100,000 on a hot summer day (Tutelian 2006).

Long Beach's age structure in 2000 showed an aging population, with a preponderance of residents in the 60 to 69 years age group, followed by the 70-79 years age group, indicating a large retirement population. There were few residents here under the age of 30, and more women over the age of 80 than in any category from age 0-40 (see Figure 1).

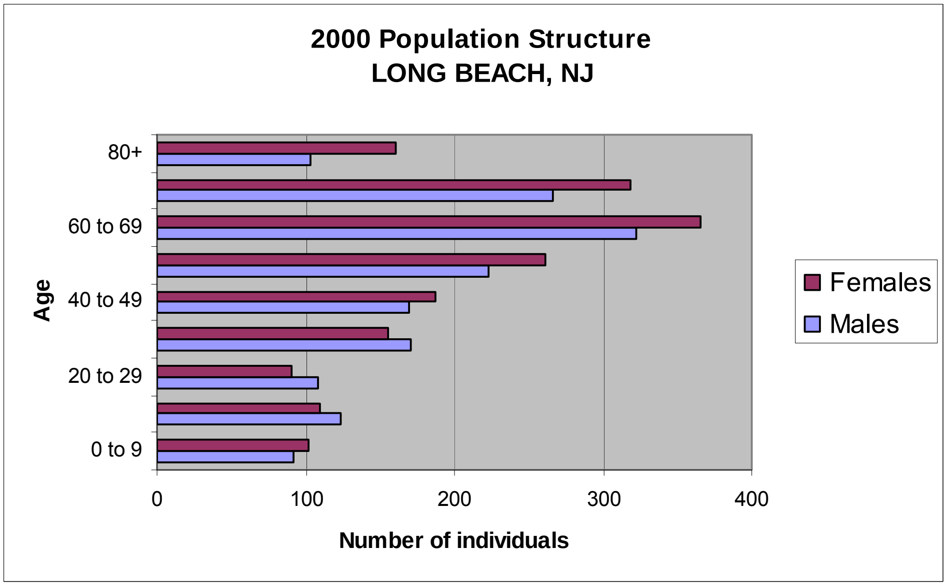


Figure 1. Long Beach's population structure by sex in 2000 (US Census Bureau 2000)

The majority of the population of Long Beach in 2000 was white (98.5%), with 0.4% of residents black or African American, 0.1% Native American, 0.4% Asian, and 0.1% Pacific Islander or Hawaiian (see Figure 2). Only 2.1% of the population identified themselves as Hispanic/Latino (see Figure 3). Residents linked their heritage to a number of different ancestries including: Irish (25.0%), German (24.5%), English (16.5%), Italian (14.7%), and Polish (10.3%). With regard to region of birth, 56.8% were born in New Jersey, 39.2% were born in a different state and 3.7% were born outside of the U.S. (including 1.4% who were not United States citizens).

295 These and all census data, unless otherwise referenced, can be found at http://factfinder.census.gov/home/saff/main.html; census data used are for Long Beach township

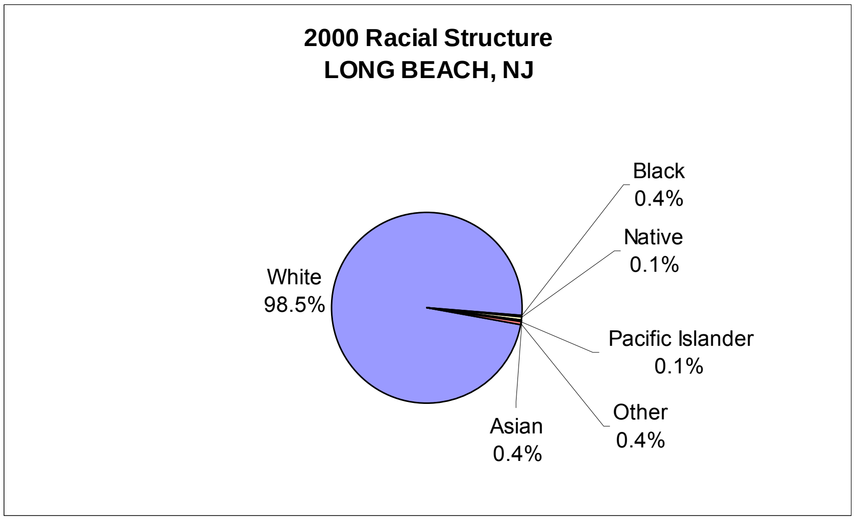


Figure 2. Racial Structure in 2000 (US Census Bureau 2000)

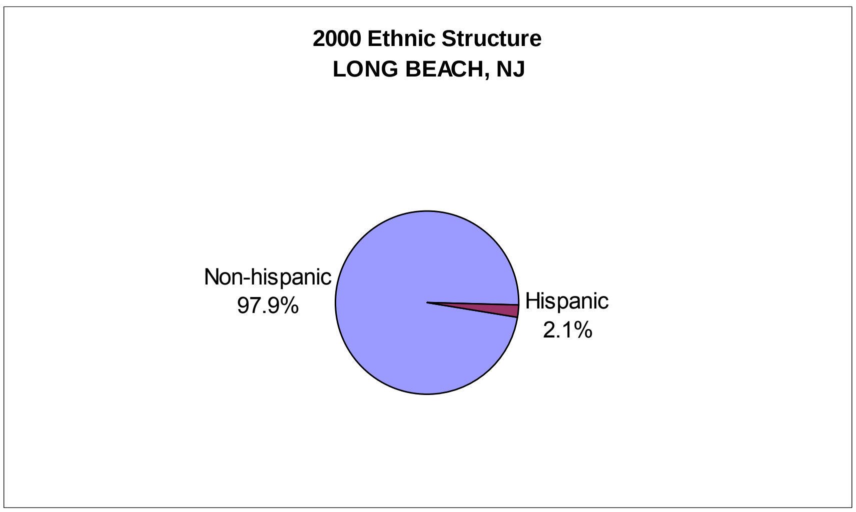


Figure 3. Ethnic Structure in 2000 (US Census Bureau 2000)

For 92.4% of the population 5 years old and higher in 2000 only English was spoken in the home, leaving 7.6% in homes where a language other than English was spoken, including 1.8% of the population who spoke English less than "very well."

Of the population 25 years and over, 92.0% were high school graduates or higher and 36.7% had a bachelor's degree or higher. Again of the population 25 years and over, 2.0% did not reach ninth grade, 5.9% attended some high school but did not graduate, 28.8% completed high school, 21.8% had some college with no degree, 4.7% received their associate's degree, 23.9% earned their bachelor's degree, and 12.8% received either a graduate or professional degree.

Barnegat Light

According to Census 2000 data296, Barnegat Light (an independent borough on Long Beach Island) had a total population of 764, up 13.2% from 1990 (US Census Bureau 1990). Of this total in 2000, 49.1% were female and 50.9% were male. The median age was 54.9 years and 83.9% of the population was 21 years or older while 39.5% were 62 or older.

296 These and all census data, unless otherwise referenced, can be found at http://factfinder.census.gov/home/saff/main.html; census data used are for Barnegat Light borough

Barnegat Light's age structure showed a preponderance of 60 to 69 years age group, indicating a large retirement population. In a perhaps related phenomenon, the age group of 20-29 is very small, with almost no females (see Figure 4). Among the already small numbers of children and young people, young females are apparently almost uniformly leaving the community after high school.

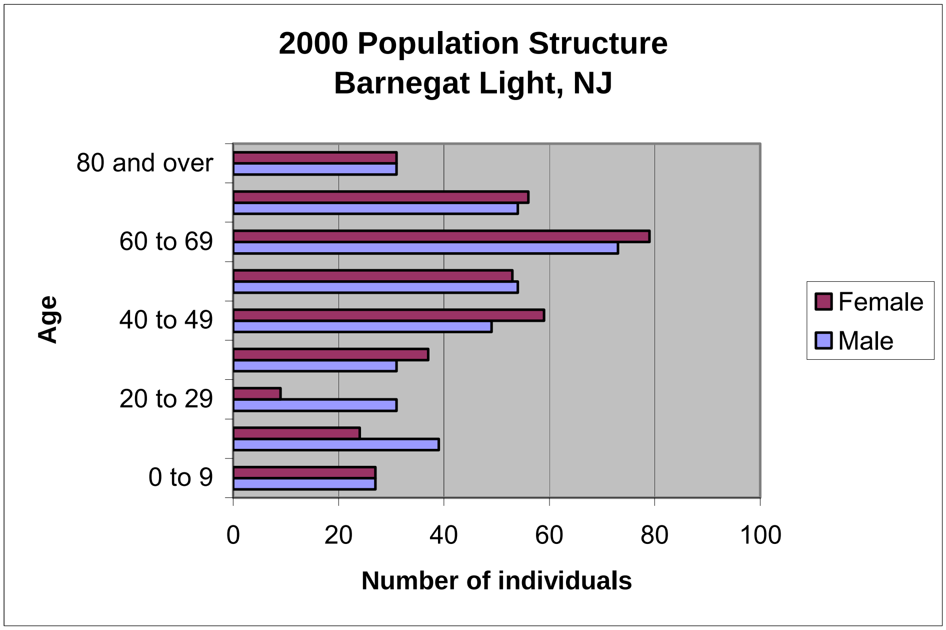


Figure 4. Barnegat Light's population structure by sex in 2000 (US Census Bureau 2000)

The majority of the population of Barnegat Light in 2000 was white (98.3%), with 0.5% of residents black or African American, no Native Americans, 0.3% Asian, and 0.3% Pacific Islander or Hawaiian (see Figure 5). Only 0.8% of the total population was Hispanic/Latino (see Figure 6). Residents linked their heritage to a number of ancestries including: Irish (28.0%), German (23.2%), English (17.4%), and Italian (14.6%). With regard to region of birth, 55.7% were born in New Jersey, 39.8% were born in a different state and 3.2% were born outside of the U.S. (including 0.4% who were not United States citizens).

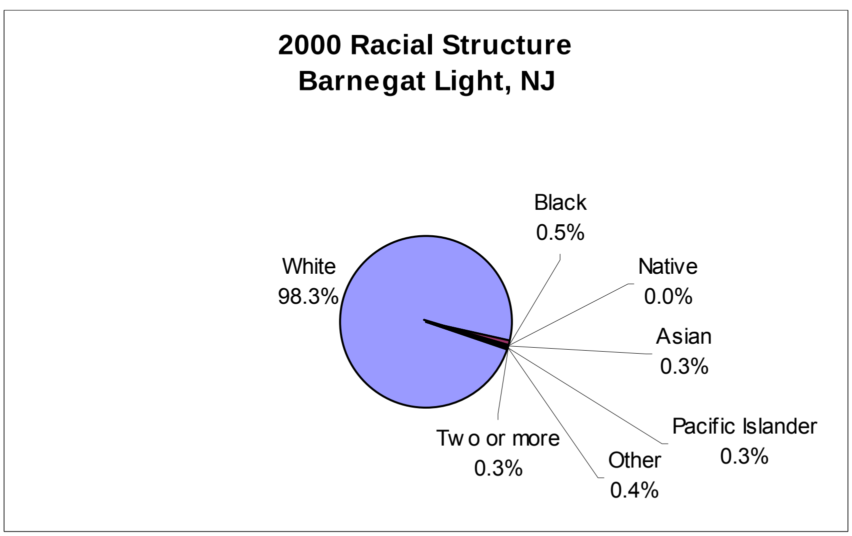


Figure 5. Racial Structure in 2000 (US Census Bureau 2000)

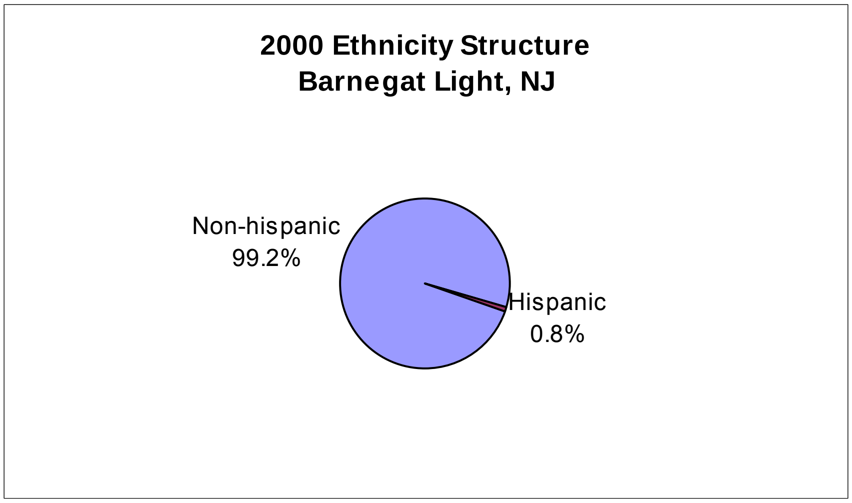


Figure 6. Ethnic Structure in 2000 (US Census Bureau 2000)

For 92.7% of the population, only English was spoken in the home, leaving 7.3% in homes where a language other than English was spoken, including 1.5% of the population who spoke English less than "very well."

Of the population 25 years and over, 92.1% were high school graduates or higher and 38.9% had a bachelor's degree or higher. Again of the population 25 years and over, 2% did not reach ninth grade, 5.9% attended some high school but did not graduate, 29.3% completed high school, 17% had some college with no degree, 6.9% received their associate's degree, 21.5% earned their bachelor's degree, and 17.4% received either a graduate or professional degree.

Although religious percentages are not available through the U.S. Census, according to the Association of Religion Data Archive (ARDA) in 2000 the religion with the highest number of congregations and adherents in Ocean County was Catholic with 33 congregations and 212,482 adherents. Other prominent congregations in the county were Jewish (35 with 11,500 adherents), The United Methodist Church (28 with 9,534 adherents), Evangelical Lutheran Church in America (11 with 6,731 adherents), and Presbyterian Church (U.S.A.) (11 with 6,489 adherents). The total number of adherents to any religion was up 21.9% from 1990 (ARDA 2000).

There are seventeen houses of worship listed on Long Beach Island, including six in Long Island Township, of which four are Catholic and one is Jewish, and the rest are Protestant (LBInet 2008).

Issues/Processes

As of 2006 the Army Corps of Engineers wishes to begin a beach nourishment project on Long Beach Island to restore the eroding beaches here, but is meeting with resistance from homeowners, who are concerned that the planned dunes will obstruct their water view, and that more beach space will mean more beach goers in front of their homes. The government would require easements from property owners to access the shore for construction, and the home owners are reluctant to provide them. If the beach nourishment project does not take place, the beach and the waterfront homes may soon be lost (Anon 2006).

One emerging trend (as of 2006) on Long Beach Island and in other similar summer resort areas is that as real estate prices soar, many year-round residents are selling their homes for bigger homes on the mainland, tempted by the large price they can get. These homes are bought up by those using them as summer homes. The results are dwindling year-round populations on places like Long Beach Island, and a resulting loss in year-round businesses and students in local schools (AP 2005).

Like many other coastal communities, Barnegat Light must deal with the forces of rapidly increasing home prices and the resulting gentrification. Because the community is physically so small, there is very little land area for development, and the development of condominiums or other properties generally involves land in existing use. The high housing costs are encouraging many families to move to the mainland, and many of those employed in the commercial fishing industry now do not reside in Barnegat Light (Stoffle 2003).

Some beach areas on Long Beach are closed during the summers for piping plover nesting; local anglers complain this restricts them from prime beach area from which to cast (Patberg 2006).

Cultural attributes

There are a number of events throughout the summer held all over Long Beach Island. Long Beach Island Surf Fishing Tournament is an annual competition that has been held for over fifty years. It takes place throughout most of October and November, with cash prizes and trophies being awarded in angling competitions for bluefish and striped bass, and includes a popular surfcasting seminar.

Chowderfest is an annual event that is held in Beach Haven in early October and features a competition between all the restaurants on Long Beach Island as they vie for the honor of creating the tastiest chowder. The Alliance for a Living Ocean hosts beach seining events and the annual FantaSea Festival to educate the public about the coastal resources surrounding Long Beach Island. Barnegat Light holds an annual Blessing of the Fleet in the Barnegat Light Yacht Basin each June to pray for the community's commercial fishermen (LBInet 2008). Viking Village has a very popular Dock Tour that has won several awards and in September 2007, hosted the New Jersey Mayors Conference.297

Infrastructure

Current Economy

Long Beach Township

Tourism and real estate are the two major industries in Long Beach (Tutelian 2006). Total property values on the island exceed $11 billion (Zedalis 2005). According to the U.S. Census 2000298, 44.7% (1,351 individuals) of the total population 16 years of age and over were in the labor force, of which 2.3% were unemployed, no residents were in the Armed Forces, and 42.5% were employed. It should be noted that 55.3% of the population 16 and over were not in the labor force at all (see Figure 7). This high percentage relative to other locations further reinforces the nature of Long Beach as a retirement community.

Figure 7. Employment Structure in 2000 (US Census Bureau 2000)

According to Census 2000 data, jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 10 positions or 0.8% of all jobs. Self employed workers, a category where fishermen might be found, accounted for 141 positions or 11.0% of jobs. Educational health and social services (18.2%), arts, entertainment, recreation, accommodation and food services (17.1%), construction (14.6%), and retail trade (11.5%) were the primary industries.

297 Community Review Comments, Greg DiDomenico, Garden State Seafood Association, August 24, 2007

298 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

Median household income in Long Beach was $48,697 (up 53.3% from $31,775 in 1990 [US Census Bureau 1990]) and median per capita income was $33,404. For full-time year round workers, men made approximately 33.2% more per year than women.

The average family in Long Beach consisted of 2.50 persons. With respect to poverty, 3.8% of families (down from 4.2% in 1990 [US Census Bureau 1990]) and 5.1% of individuals were below the U.S. Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families, depending on number of persons (2-9) (US Census Bureau 2000b). In 2000, 18.4% of all families (of any size) earned less than $35,000 per year (the poverty threshold for a family of nine).

In 2000, Long Beach had a total of 9,023 housing units of which 18.4% were occupied and 74.1% were detached one unit homes. Only 5.0% of these homes were built before 1940. Mobile homes/vans/boats accounted for 4.3% of the total housing units; 88.6% of detached units had between 2 and 9 rooms. In 2000, the median cost for a home in this area was $334,400. Of vacant housing units, 83.3% were used for seasonal, recreational, or occasional use. Of occupied units, 13.9% were renter occupied.

Barnegat Light

The small businesses of Barnegat Light are very reliant on the summer tourist economy and the year round fishing industry. The town relies heavily on its commercial fishing industry year round, but in winter it becomes the economic mainstay for the town –employing as many as 150 local people to work at the marinas (McCay and Cieri 2000). The most significant sources of employment in the town are the fishing industry and real estate.299 According to the U.S. Census 2000, 46.9% (305 individuals) of the total population 16 years of age and over were in the labor force, of which 1.2% were unemployed, 0.8% were in the Armed Forces, and 44.9% were employed. It should be noted that 53.1% of the population 16 and over are not in the labor force at all (see

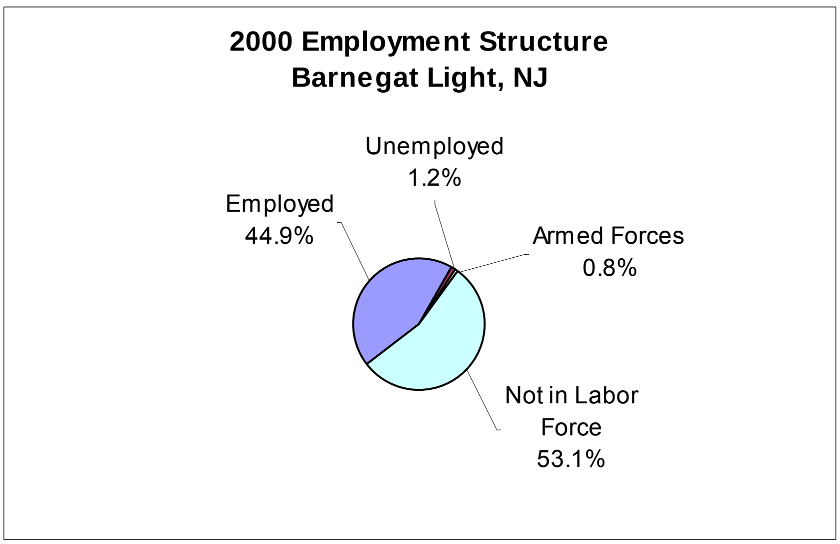


Figure). This high percentage relative to other locations further reinforces the nature of Barnegat Light as a retirement community.

299 Borough of Barnegat Light, Municipal Office, Personal Communication, June 21, 2005

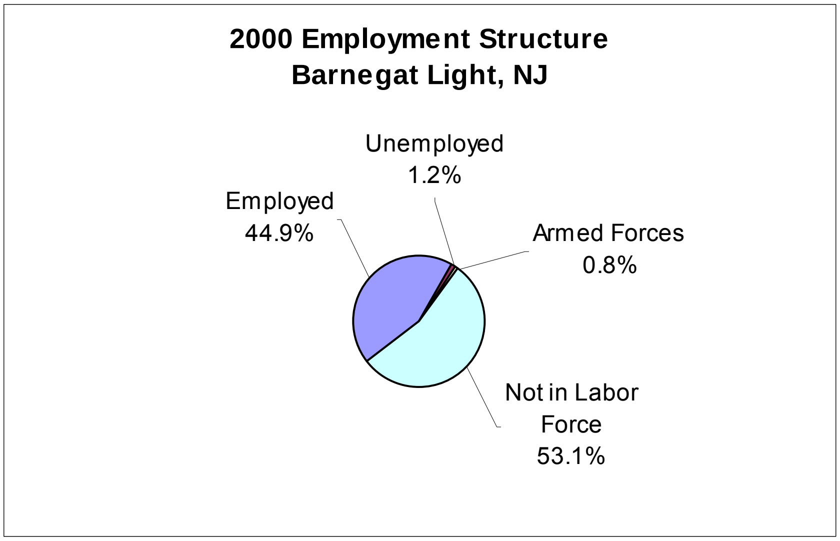


Figure 8. Employment Structure in 2000 (US Census Bureau 2000)

According to Census 2000 data, jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 24 positions or 8.2% of all jobs. Self employed workers, a category where fishermen might be found, accounted for 55 positions or 18.8% of the labor force. Educational health and social services (16.8%), arts, entertainment, recreation, accommodation and food services (11%), construction (10.3%), finance, insurance, real estate and rental and leasing (10.3%), and professional, scientific, management, administrative and waste management services (9.2%) were the primary industries.

Median household income in Barnegat Light was $52,361 (up 17.3% from $37,955 in 1990 [US Census Bureau 1990]) and median per capita income was $34,599. For full-time year round workers, males made approximately 17.6% more per year than females.

The average family in Barnegat Light consisted of 2.6 persons. With respect to poverty, 2.6% of families (down from 4.2% in 1990 [US Census Bureau 1990]) and 4.7% of individuals were below the U.S. Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families, depending on number of persons (2-9) (US Census Bureau 2000b). In 2000, 33.7% of all families of any size earned less than $35,000 per year (the poverty threshold for a family of nine).

In 2000, Barnegat Light had a total of 1,207 housing units of which 30.7% were occupied and 88.4% were detached one unit homes. Only 3.6% of these homes were built before 1940. Mobile homes/vans/boats accounted for 0.2% of the total housing units; 86.4% of detached units had between 2 and 9 rooms. In 2000, the median cost for a home in this area was $299,400. Of vacant housing units, 93.4% were used for seasonal, recreational, or occasional use. Of occupied units, 12.1% were renter occupied.

Governmen*t*

The township of Long Beach is located in Ocean County and is governed by a board of three commissioners, one of whom is the mayor (Township of Long Beach nd). An elected mayor and a six-person borough council run Barnegat Light's local governance (Barnegat Light nd).

Fishery involvement in government

The local government is not directly involved in the fishing industry in Barnegat Light. However, the mayor himself owns several scallop boats.[300] The Barnegat Bay National Estuary Program is one of 28 estuaries of "national significance" designated and federally funded by the US Environmental Protection Agency. It is a partnership of federal, state, and municipal agencies as well as non-profit organizations and businesses working together to protect this estuary.

300 Borough of Barnegat Light, Municipal Office, Personal Communication, June 21, 2005

Institutional

Fishing associations

The Beach Haven Charter Fishing Association represents charter boats in the borough of Beach Haven and around Long Beach Island. Blue Water Fishermen's Association is located in Barnegat Light. This association is made up of tuna and swordfishermen as well as others involved in the commercial fishery of highly migratory species. Every vessel at Viking Village is a member of the Garden State Seafood Association and the Monkfish Defense Fund. In addition, the scallop fleet are members of the Fisheries Survival Fund.301

Garden State Seafood Association in Trenton is a statewide organization of commercial fishermen and fishing companies, related businesses and individuals working in common cause to promote the interests of the commercial fishing industry and seafood consumers in New Jersey.

The Jersey Coast Anglers Association (JCAA) is an association of over 75 saltwater fishing clubs throughout the state. Founded in 1981, the purpose of the organization is to unite and represent marine sport anglers to work towards common goals. The JCAA website (www.jcaa.org) also provides links for many NJ anglers associations.

Fishery assistance centers

No fishing assistance centers were identified through secondary sources in this research.

Other fishing related organizations

The Alliance for a Living Ocean on Long Beach Island is focused on promoting and maintaining clean water and a healthy coastal environment. They host a number of educational events including eco tours, beach walks, and seining, and also hold an annual festival. The Recreational Fishing Alliance, a national lobbying group, is headquartered near Barnegat Light.

Physical

Long Beach Island is a barrier island with the Atlantic Ocean on one side, and Barnegat Bay and Little Egg Harbor on the other. Ocean County has three general aviation airports – Eagles Nest Airport at West Creek, Lakewood Airport at Lakewood, and Robert J. Miller Airpark in Berkeley Township – but none of these has regularly scheduled service (Ocean County Library nd). Barnegat Light is at 52 miles from Atlantic City International Airport, 72 miles from Trenton Mercer Airport, 78 miles from the Philadelphia International Airport and 98 miles from the Newark Liberty International Airport. Toms River is 29 miles from Long Beach and Atlantic City is 47 miles away. New York City is about 102 miles by car. Route 72 is the only road connecting Long Beach Island with the New Jersey mainland; it connects Ship Bottom with Beach Haven West and Manahawkin.

Long Beach Island has a number of bait and tackle shops including Jingles Bait and Tackle, Surf City Bait and Tackle, and Fisherman's Headquarters. There is also a number of marinas located along the island (LBIWC nd). Sportsman's Marina bills itself as a fishing and crabbing marina, and also offers boat rentals. Ocean County lists seven marinas in Long Beach Township and at least 30 more along the island (OCDP 2007). Hagler's Marina is one in Brant's Beach with 66 slips offering gas, bait, tackle, ice, and supplies; another is Escape Harbor Marina. There are also four boat ramps listed for Long Beach Island (LBIWC nd).

Barnegat Light is one of the most important fishing ports in Ocean County. Barnegat Light is 16.2 miles from Toms River, NJ, 67.2 miles from Jersey City, NJ, and 67.2 miles from New York, NY. Docking is available through five marinas in Barnegat Light. The two largest docks have 36 full-time resident commercial boats, working year round, as well as recreational vessels and transient vessels. One of these two largest docks is completely occupied by commercial boats; the owners are also commercial fishermen. These commercial boats include seven scallopers, ten longliners that fish for tuna, swordfish, and tilefish, and about nine inshore-fishing net boats. The dock also has three offloading stations. The second of the largest docks accommodates ten commercial

301 Community Review Comments, Greg DiDomenico, Garden State Seafood Association, August 24, 2007

boats, fifteen charter boats, and twenty-five recreational vessels. The three remaining docks can each accommodate approximately 30- 35 boats, most of which are recreational boats and charter boats. Most of the recreational and sport fishing boats that utilize this port are here for part of the year, usually from May or June through early October (Wilson et al. 1998).

Involvement in Northeast Fisheries302

Commercial

Barnegat Light, on the north end of Long Beach Island, is one of New Jersey's largest commercial fishing ports. Barnegat Light port has a significant offshore longline fishery, targeting tuna species (especially yellow fin and big eye) for most of the year, and swordfish part of the year. However, to avoid confidentiality issues due to a small number of dealers, all Barnegat Light/Long Beach landings are combined.

Located adjacent to the formerly infamous Barnegat Inlet, Barnegat Light's two commercial docks host a range of vessels from small, local day boats to globe-spanning longliners. Several fishermen in Barnegat Light pioneered the deep water tilefish fishery in the 1970s, successfully marketing this fish as the "poor man's lobster." Barnegat Light is the home port of many members of the East Coast's longline fleet. Barnegat Light longliners routinely fish in the high seas, targeting several species of tuna as well as swordfish on trips that last one to several weeks.

Barnegat Light is also home to several state-of-the-art scallop vessels and a fleet of smaller, inshore gillnetters (NJ Fishing nd). The scallop fleet is made up both of larger vessels which may spend several days at sea at a time, fishing for scallops throughout the Mid-Atlantic, and several vessels which engage in "day trip" scalloping closer to the coast. The day trips can also be an important means for full-time scallopers and some other fishermen to subsidize their catch, as scallop vessels do not need to use their days at sea to fish for scallops inshore (Stoffle 2003).

Viking Village, one of Barnegat Light's two commercial docks, is one of the largest suppliers of fish and seafood on the Eastern Seaboard. Each year over 4 million pounds of seafood are packed out over the commercial dock of Viking Village and shipped locally and internationally. Viking Village is homeport to seven scallopers, ten longliners and about nine inshore-fishing net boats, which fish blues, weakfish, monkfish, dogfish and shad. Each boat is independently owned and uses Viking Village for pack-out, marketing and sale of the catch. Some local restaurants and seafood dealers purchase products from Viking Village directly, including Wida's, Surf City Fishery, Beach Haven Fishery and Cassidy's Fish Market. Viking Village and the boats docked there employ about 200 people (NJ Fishing nd). There are also a number of bait and tackle retailers located in town, such as Barnegat Light Bait and Tackle and Eric's Bait and Boat (LBIWC nd). Viking Village is home to some of the last remaining larger gillnet vessels. While monkfish landings are quite high for this area, croaker and bluefish are also significant when compared to other areas. Due to management measures, dogfish, shad, and striped bass are no longer species fishermen can harvest out of this port.303

Landings and vessel data combine Barnegat Light with Long Beach Island data. The most valuable fisheries in Barnegat Light/Long Beach in 2006 were sea scallops (over $18 million), monkfish (nearly $3 million), and swordfish (listed in the "Other" category), according to NMFS landings data (see Table 1). Scallop landings were above the 10-year average in 2006. Tilefish was also an important species in 2006, with a significant increase in value from the 1997-2006 average. Overall, the value of the catch, both that of vessels with their homeport in

302 In reviewing the commercial landings data several factors need to be kept in mind. 1) While both federal and state landings are included, some states provide more detailed data to NMFS than others. For example, shellfish may not be included or data may be reported only by county and not by port. 2) Some communities did not have individual port codes until more recently. Before individual port codes were assigned, landings from those ports were coded at the county level or as an aggregate of two geographically close small ports. Where landings were coded at the county level they cannot be sorted to individual ports for those earlier years, e.g., prior to 2000. 3) Where aggregated codes were used, those aggregate codes may still exist and be in use alongside the new individual codes. Here the landings which are still assigned to the aggregate port code cannot be sorted into the individual ports, so port level data are only those which used the individual port code. 4) Even when individual port codes exist, especially for small ports, landings may be coded at the county level. Here again it is impossible to disaggregate these to a port level, making the port level landings incomplete. 5) In all these cases, the per port data in this profile may under report the total level of landings to the port, though all landings are accounted for in the overall NMFS database.

303 Community Review Comments, Greg DiDomenico, Garden State Seafood Association, August 24, 2007

Barnegat Light and those landing their catch here, increased over the 10-yr period (1997-2006; see Table 2). In 2007 Barnegat Light ranked 7th out of 9 ports with at least $100,000 of skate landings, and 9th out of 15 ports with skate landings of at least 100,000lbs. Skate is primarily landed here as wings rather than bait. There is also a mixed monkfish/skate fishery off northern New Jersey, near Point Pleasant. There are 3 skate dealers listed in Barnegat Light.

The number of vessels both home ported in Barnegat Light and whose owner's city was Barnegat Light also increased over the period of 1997-20006. In 2007, among skate permits, Barnegat Light ranks 7th out of 9 in terms of homeport listings (2.8% of all skate permits) and 5th out of 9 in terms of listings of owner's town of residence (1.3% of all skate permits).

Landings by Species

Table 1. Dollar value of Federally Managed Groups of landings in Barnegat Light/Long Beach

	Average from 1997-2006	2006 only
Scallop	9,531,153	18,867,447
Monkfish	3,343,334	2,861,690
Other304	2,534,483	2,167,254
Tilefish	448,777	CONFIDENTIAL
Bluefish	268,275	211,161
Dogfish	157,643	0
Skate	107,722	60,980
Summer Flounder, Scup, Black Sea Bass	79,292	202,918
Squid, Mackerel, Butterfish	53,644	5,501
Largemesh Groundfish305	3,820	1,206
Smallmesh Groundfish306	1,514	44
Lobster	861	0
Herring	620	4,365

Vessels by Year**307**

Table 2. All columns represent vessel permits or landings value combined between 1997-2006

Barnegat Light (Year)	# Vessels (home ported)	# Vessels (owner's city)	Level of fishing home port ($)	Level of fishing landed port ($)
1997	43	28	6,144,679	10,303,886
1998	38	27	6,054,709	10,171,814
1999	54	32	11,127,349	12,119,138
2000	65	38	14,417,637	14,594,799
2001	71	39	14,709,246	14,387,998
2002	72	38	14,657,863	14,568,116
2003	81	39	16,623,969	16,381,772

304 "Other" species includes any species not accounted for in a federally managed group

305 Largemesh groundfish: cod, winter flounder, yellowtail flounder, American plaice, sand-dab flounder, haddock, white hake, redfish, and pollock

306 Smallmesh multi-species: red hake, ocean pout, mixed hake, black whiting, silver hake (whiting)

307 Numbers of vessels by owner's city and homeport are as reported by the permit holder on permit application forms. These may not correspond to the port where a vessel lands or even spends the majority of its time when docked.

Barnegat Light (Year)	# Vessels (home ported)	# Vessels (owner's city)	Level of fishing home port ($)	Level of fishing landed port ($)
2004	79	38	20,657,786	20,560,559
2005	80	42	26,601,829	26,725,708
2006	78	42	24,203,962	25,497,592

 # Vessels home ported = No. of permitted vessels with location as homeport
 # Vessels (owner's city) = No. of permitted vessels with location as owner residence308
Level of fishing home port ($) = Landed value of fisheries associated with home ported vessels
Level of fishing landed port ($) = Landed value of fisheries landed in location

Recreational

In New Jersey the charter/party fleet is the largest on east coast. Many vessels are over 120ft long and carry over 150 people.309 Just a glance at the large number of marinas, charter operations, bait and tackle shops, and boat ramps on Long Beach Island makes it clear that recreational fishing is important here (see above). Between 2001- 2005, there were 40 charter and party vessels making 7,189 total trips registered in logbook data by charter and party vessels in Long Beach carrying a total of 172,212 anglers (NMFS VTR data). To further highlight the importance of the recreational fishing sector, at the request of the Ocean County government, the Beach Haven Charter Fishing Association estimated the total economic impact of the Associations member vessels. Values were estimated to exceed $3 million per year for the community.310

Hot Tuna Charters is one charter boat in Long Beach that specifically targets tuna, and offers both inshore and canyon fishing. Jersey Girl Sport Fishing is another charter company with both inshore trolling and wreck fishing for tuna, skipjack, mahi mahi, seabass, croaker, fluke, porgies, and more. The Beach Haven Charter Fishing Association represents several different boats in Beach Haven and Long Beach. Many recreational and charter fishing boats can be found in Barnegat Light, along with marinas, boat rental facilities, and bait and tackle shops (Barnegat Light nd).

Subsistence

Information on subsistence fishing in Barnegat Light/Long Beach is either unavailable through secondary data collection or the practice does not exist.

FUTURE

As of 2005 the New Jersey State Department of Transportation had plans to build a second bridge alongside the existing one to Long Beach Island, to address the poor structural conditions of the existing bridge. This would not affect the amount of traffic able to travel to the island (Larsen 2005). Also as of 2005, if the necessary easements are signed by property owners on the island, the Army Corps of Engineering will soon begin a $75 million beach renourishment project expected to last 50 years (Zedalis 2005). Information has not yet been obtained regarding people's perception of the future in Long Beach.

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308 The Owner-City from the permit files is technically the address at which the owner receives mail concerning their permitted vessels, which could reflect the actual location of residence, the mailing address as distinct from residence, owner business location, or the address at which a subsidiary receives mail about the permits.
309 Community Review Comments, Bruce Freeman, NJ Coast Anglers Association, October 2, 2007
310 Community Review Comments, Capt. Lindsay Fuller, Treasurer, Beach Haven Charter Fishing Association, September 25, 2007

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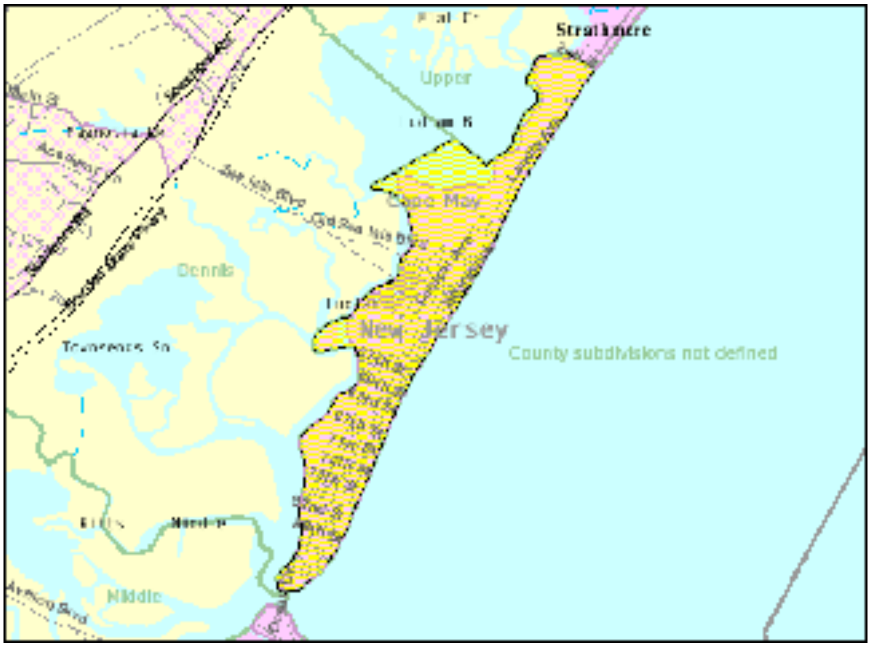
q. SEA ISLE CITY, NJ[311]

Community Profile[312]

X. PEOPLE AND PLACES

i.Regional orientation

Sea Isle City (39.15°N, 74.70°W) is located along the Atlantic coast in Cape May County, New Jersey. It has an area of 2.5mi^2 of which 2.2mi^2 is land and 0.9mi^2 is water (USGS 2008). On its landward borders are the Townships of Upper, Dennis, and Middle, as well as the Borough of Avalon.



Map 15. Location of Sea Isle City, NJ (US Census Bureau 2000a)

ii.Historical/Background

The barrier island of Sea Isle City was sold to Joseph Ludlum in 1692 by a Quaker group, the West Jersey Proprietors, and named Ludlum's Island. For nearly a century before its sale, Ludlum Island was covered in various types of trees and grasses. Ludlum divided the land into three sections; Ludlam's Island, Townsend's Inlet, and Corsen's Inlet before its sale in 1880 to a developer, Thomas Landis (Sawn 1964).

Thomas Landis transformed Ludlum Island into a vacation place modeled off of Venice, Italy. The island was connected to mainland New Jersey with roads and rail lines, and became a "Sea and Sand Family Vacationland" (Beachcomber 1998), which is how it is known today. Many hotels and restaurants were built near the beachfront providing for a development in tourism. Today, the town serves as a year round residency comprised mainly of middle-aged to elderly residents, and a summer vacationland for tourists. Sea Isle City is sometimes referred to as a

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311 These community profiles have been created to serve as port descriptions in Environmental Impact Statements (EISs) for fisheries management actions. They also provide baseline information from which to begin research for Social Impact Assessments (SIAs). Further, they provide information relevant to general community impacts for National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and information on minorities and low income populations for Executive Order (E.O.) 12898 on Environmental Justice.

312 For purposes of citation please use the following template: "Community Profile of *Town, ST*. Prepared under the auspices of the National Marine Fisheries Service, Northeast Fisheries Science Center. For further information contact Lisa.L.Colburn@noaa.gov."

"fishermen's paradise" because of the large number of charter boats and the amount of fishing which occurs here (Beachcomber 1998).

iii. *Demographics*313

According to the Census 2000 data314, Sea Isle City had a total population of 2,835, up 66.8% from a reported population of 1,700 in 1990 (US Census Bureau 1990). Of this 2000 total, 47.8% were males and 52.2% were females. The median age was 51.3 years and 82.5% of the population was 21 years or older while 32.0% were 62 or older.

The population structure for Sea Isle City clearly shows an aging population, with the vast majority of residents in their 50s, 60s, and 70s, with quite a few residents in the 80+ category as well. Like many small communities, the population takes a dip for the 20-29 age grouping, but the number of children in the 0-9 and 10-19 age categories is small to begin with (see Figure 1). This paints a picture of Sea Isle City as largely a retirement community. The male population subtly decreases as age groups increase by decade, but females have an increase in the 70-79 age category.

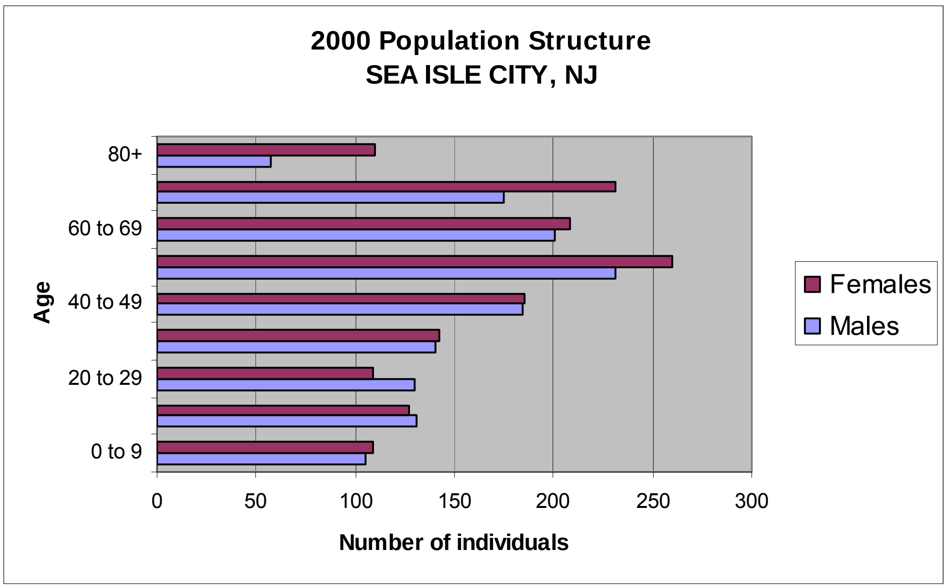

Figure 1. Sea Isle City's population structure by sex in 2000 (US Census Bureau 2000a)

The majority of the population was white (98.8%), with 0.3% black or African American, 0.4% Asian, 0.4% Native American, and 0.04% Pacific Islander or Hawaiian (see Figure 2). Only 1.1% of the population identified themselves as Hispanic/Latino (see Figure 3). Residents link their backgrounds to a number of different ancestries including: Irish (38.9%), German (24.1%), Italian (22.4%), and English (12.7%). With regard to region of birth, 35.2% of residents were born in New Jersey, 61.0% were born in a different state, and 0.4% were born outside the U.S. (all are US citizens).

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313 While mid-term estimates are available for some larger communities, data from the 2000 Census are the only data universally available for the communities being profiled in the Northeast. Thus for cross-comparability we have used 2000 data even though these data may have changed significantly since 2000 for at least some communities.
314 These and all census data, unless otherwise referenced, can be found at U.S. Census: American Factfinder 2000 http://factfinder.census.gov/home/saff/main.html; census data used are for Sea Isle City city, NJ

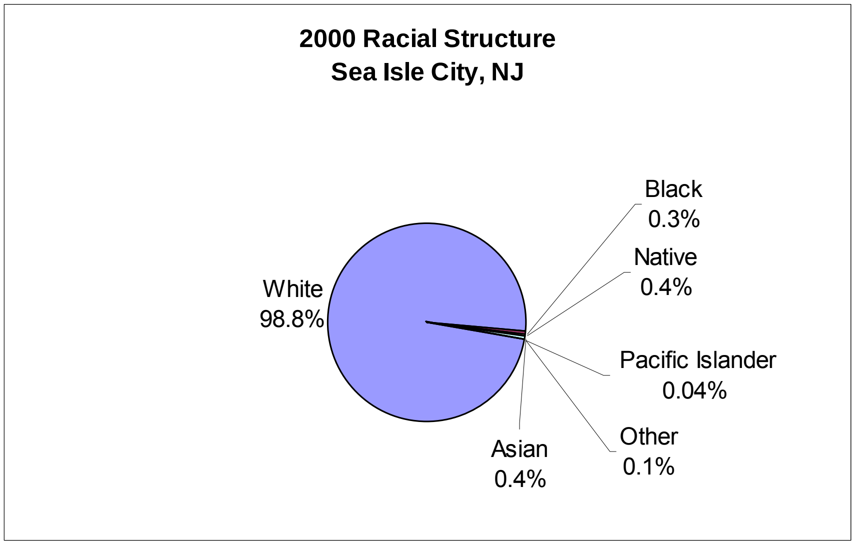

Figure 2. Racial Structure in 2000 (US Census Bureau 2000a)

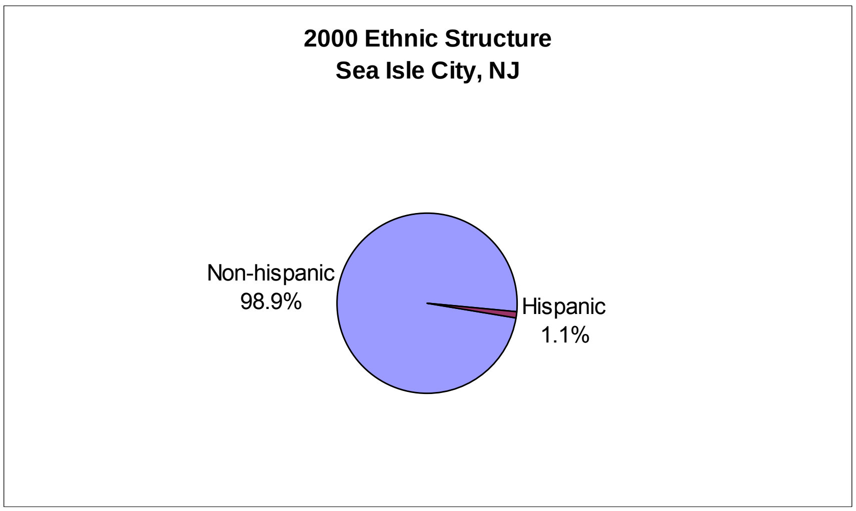

Figure 3. Ethnic Structure in 2000 (US Census Bureau 2000a)

For 92.4% of the population, only English was spoken in the home, leaving 7.6% in homes where a language other than English is spoken, including 1.2% of the population who spoke English less than "very well" according to the 2000 Census.

Of the population 25 years and over, 85.2% are high school graduates or higher and 28.3% have a bachelor's degree or higher. Again of the population 25 years and over, 3.4% did not reach ninth grade, 11.4% attended some high school but did not graduate, 32.8% completed high school, 17.1% had some college with no degree, 7.0% received an associate's degree, 18.5% earned a bachelor's degree, and 9.8% received either a graduate or professional degree.

Although religion percentages are not available through U.S. Census data, according to the Association of Religion Data Archives (ARDA) in 2000, the religion with the highest number of congregations in Cape May County was Catholic with 15 congregations and 32,307 adherents. Other prominent congregations in the county were United Methodist (25 with 5,133 adherents), Episcopal (6 with 1,588 adherents) and Evangelical Lutheran Church in America (6 with 2,142 adherents). The total number of adherents to any religion was up 15% from 1990 (ARDA 2000). The churches listed in Sea Isle City are the Messiah Lutheran Church, St. Joseph's Catholic Church, Trinity Community Church, and United Methodist Church (Sea Isle City nd).

iv.Issues/Processes

Offshore wind farms have been proposed in four locations off of Cape May County, and fishermen are concerned about the impact wind turbines could potentially have on the fish or on their access to the fisheries (Curran 2005).

Cultural attributes

The Annual Cape May Country Fishing Tournament has been held annually for the past 69 years is the longest continuously running tournament on the East Coast (Cape May County nd).

y. INFRASTRUCTURE

i.Current Economy

The largest industry in Cape May County is tourism, responsible for 91.5% of the county's employment, or 32,570 jobs, and 12% of the State's tourism dollars (Cape May County nd). Smaller employers in the area are mostly small businesses involved in the summer tourist industry. Larger employers include hotels or casinos, but are generally located north of Sea Isle City, near Atlantic City.

As far as private employers, the tenth largest employer (140 employees) in Cape May County is Snow's/Doxsee Inc. (CMCCC 1999), with an 86,000 square-foot plant in Cape May that produces clam products including chowder, soups, canned clams, clam juice, and seafood sauces. Snow's/Doxsee is the only domestic manufacturer to harvest its own clams, and the company maintains the largest allocation for fishing and harvesting ocean clams in the United States. Cold Spring Fish and Supply employs 500 people, and is the third largest private employer in the county. Other private employers in Cape May County include Cape Regional Medical Center (1,100), Acme Markets (600), WaWa (485), Holy Redeemer Visiting Nurse (250), and Super Fresh (250) (CMCCC 1999).

According to the U.S. Census 2000[315], 56.6% (1,372 individuals) of the total population 16 years of age and over

were in the labor force (see Figure), of which 3.7% were unemployed, none were in the armed forces, and 53.0% were employed. The fact that 43.4% of the population over the age of 16 is not in the labor force reinforces the idea that Sea Isle City serves as a retirement area to many.

315 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

Figure 4. Employment structure in 2000 (US Census Bureau 2000a)

According to Census 2000 data, jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for no jobs. Self employed workers, a category where fishermen might be found, accounted for 89 positions or 6.9% of jobs. Finance, insurance, real estate and rental and leasing (9.4%), educational, health and social services (19.4 %), retail trade (13.3%), professional, scientific, management, administrative, and waste management services (5.1%), and construction (7.1%) were the primary industries.

Median household income in Sea Isle City is $45,708 (up 7.1% from $32,218 in 1990 [US Census Bureau 1990]) and median per capita income is $28,754. For full-time year round workers, males made approximately 25.6% more per year than females.

The average family in Sea Isle City consists of 2.07 persons. With respect to poverty, 6.4% of families (up from 2.0% in 1990) and 7.6% of individuals earned below the official U.S. Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families, depending on number of persons (2-9) (US Census Bureau 2000b). In 2000, 31.6% of all families (of any size) earned less than $35,000 per year.

In 2000, Sea Isle City had a total of 6,640 housing units of which 19.8% were occupied and 20.7% were detached one unit homes. Approximately five percent (4.9%) of these homes were built before 1940. Mobile homes, boats, RVs, vans, etc. accounted for 0.2% of the total housing units; 44.1% of detached units have between 2 and 9 rooms. In 2000, the median cost for a home in this area was 280,100. Of vacant housing units, 73.5% were used for seasonal, recreational, or occasional use. Of occupied units, 23.1% were renter occupied.

ii.Government

A three-chair Board of Commissioners governs Sea Isle City (Sea Isle City nd).

Fishery involvement in government

The Cape May County Planning Board supports the commercial fishing industry through a comprehensive plan that promotes land-use policies that are beneficial to the industry and opposes projects that may harm its economic or environmental condition (Cape May County nd).

iii.Institutional

iv.Fishing associations

Garden State Seafood Association in Trenton is a statewide organization of commercial fishermen and fishing companies, related businesses and individuals working in common cause to promote the interests of the commercial fishing industry and seafood consumers in New Jersey.

The Jersey Coast Anglers Association (JCAA) is an association of over 75 saltwater fishing clubs throughout the state. Founded in 1981, the purpose of the organization is to unite and represent marine sport anglers to work towards common goals. The JCAA website (www.jcaa.org) also provides links for many NJ anglers associations.

The Cape May County Party and Charter Boat Association is an organization of small recreational fishing boats located along the coast of Southern New Jersey, and includes many boats located in Sea Isle City.

Fishing assistance centers

"In an effort to maintain a healthy and safe fishing industry, the Board of Chosen Freeholders along with the State of New Jersey developed the Cape May County Revolving Fishing Loan Program. This program was instituted in 1984 and is designed to help commercial, charter and party boat fishermen with low interest loans for safety and maintenance of fishing vessels. More than $2.5 million has been loaned out to help strengthen the local fishing industry" (Cape May County nd).

Other fishing related organizations

Information on other fishing related organizations in Sea Isle City is unavailable through secondary data collection.

v.Physical

Sea Isle City is accessible via the Garden State Parkway South, Exit 17 to Sea Isle Boulevard (East) (Mapquest nd). In proximity to major cities, Sea Isle City is 66.4 miles from Philadelphia, PA and 31.7 miles from Vineland, NJ. Closer in-state areas include Avalon (4.1mi), Stone Harbor (7.8mi), Cape May Court House (9.8mi), and Ocean City (11.0mi). The nearest public-use airports are Woodbine Muni (8mi), Ocean City Muni (10mi), and Cape May County Airport (18mi). Hospitals closest to Sea Isle City are Cape Regional Medical Center (11mi), Shore Memorial Hospital (14mi), and Atlantic City Medical Center (24mi) (MapQuest nd).

There are various marinas in Sea Isle City, including Larson's Marina and Minmar Marina (Sea Isle Blvd), Pier 88 Marina (88th St), Municipal Marina (82nd St), and Sunset Pier (86th St). Boat towing is available from North Star Marine, which is located on Landis Avenue (NJ Realty 2005).

z. INVOLVEMENT IN NORTHEAST FISHERIES[316]

i.Commercial

Sea Isle City has a small commercial fishing port, which is entirely dependent on a highly dynamic inlet for access to the sea. There is a small offshore longline fishery out of Sea Isle City which targets tuna and swordfish, as well as offshore pot fisheries targeting lobster, conch, and black sea bass, and gillnetting for monkfish (McCay and Cieri 2000).

The most significant landings category in Sea Isle City is the "other" grouping, which reflects the longlining for tuna and swordfish, as well as the conch fishery. Landings in this grouping in 2006 were lower than the average values for 1997-2006. Lobster makes up the next most valuable species group, and landings of lobster in 2006 were more than double the ten-year average (see Table 1). Landings overall in Sea Isle City were variable, with the greatest landings values in 2006, at over $1.9 million. In most years, the landings here were much higher than the level of

316 In reviewing the commercial landings data several factors need to be kept in mind. 1) While both federal and state landings are included, some states provide more detailed data to NMFS than others. For example, shellfish may not be included or data may be reported only by county and not by port. 2) Some communities did not have individual port codes until more recently. Before individual port codes were assigned, landings from those ports were coded at the county level or as an aggregate of two geographically close small ports. Where landings were coded at the county level they cannot be sorted to individual ports for those earlier years, e.g., prior to 2000. 3) Where aggregated codes were used, those aggregate codes may still exist and be in use alongside the new individual codes. Here the landings which are still assigned to the aggregate port code cannot be sorted into the individual ports, so port level data are only those which used the individual port code. 4) Even when individual port codes exist, especially for small ports, landings may be coded at the county level. Here again it is impossible to disaggregate these to a port level, making the port level landings incomplete. 5) In all these cases, the per port data in this profile may under report the total level of landings to the port, though all landings are accounted for in the overall NMFS database.

home port fishing, meaning vessels are coming from elsewhere to land their catch in Sea Isle City. In 2007 Sea Isla City was 16th in terms of landed skate value ($14,960) and 17th in terms of landed skate pounds (91,715lbs). However the port is 3rd of the 7 ports dependent on skate for at least 10% of all landed pounds. Sea Isle City depends on skate for 36% of landed pounds, though only 2% of landed value. There were 3 skate dealers in Sea Isla City in 2007. There is a mixed monkfish/skate fishery off northern New Jersey, near Point Pleasant.

The number of home ported vessels here remained relatively consistent; 18 vessels in 1997 were down to 14 in 2002, but back to 18 in 2005 (see Table 2). The number of home ported vessels dropped back to 14 in 2006, however. In 2007 only 0.6% of skate permits listed Sea Isle City as homeport while 0.2% listed it as owner's town of residence. There were many more vessels home ported here than there are vessels with owners that live in Sea Isle City; most fishers likely live elsewhere because of the high price of purchasing a home here.

Landings by Species

Table 1. Dollar value by Federally Managed Groups of Landings in Sea Isle City

	Average from 1997-2006	2006 only
Other 317	831,137	758,194
Lobster	344,977	883,608
Summer Flounder, Scup, Black Sea Bass	147,461	238,662
Monkfish	34,988	31,711
Squid, Mackerel, Butterfish	8,950	0
Scallop	7,248	916
Skate	3,079	0
Bluefish	2,055	1,831
Tilefish	1,714	0
Dogfish	1,570	100
Largemesh Groundfish318	1,006	0
Smallmesh Groundfish319	191	0

Vessels by Year320

Table 22: All columns represent vessel permits or landings value combined between 1997-2006

Year	# Vessels (home ported)	# Vessels (owner's city)	Level of fishing home port ($)	Level of fishing landed port ($)
1997	18	9	1,001,242	1,062,428
1998	15	10	716,079	1,193,105
1999	15	8	665,568	1,646,613
2000	14	8	786,404	1,498,227
2001	16	6	1,408,851	1,801,031
2002	14	5	649,801	1,047,161
2003	15	5	465,846	769,442
2004	15	5	813,972	1,588,584
2005	18	4	854,644	1,322,130
2006	14	4	1,470,959	1,915,022

(Note: # Vessels home ported = No. of permitted vessels with location as homeport

317 "Other" species includes any species not accounted for in a federally managed group
318 Largemesh groundfish: cod, winter flounder, yellowtail flounder, American plaice, sand-dab flounder, haddock, white hake, redfish, and pollock
319 Smallmesh multi-species: red hake, ocean pout, mixed hake, black whiting, silver hake (whiting)
320 Numbers of vessels by owner's city and homeport are as reported by the permit holder on permit application forms. These may not correspond to the port where a vessel lands or even spends the majority of its time when docked.

 # Vessels (owner's city) = No. of permitted vessels with location as owner residence321
Level of fishing home port ($) = Landed value of fisheries associated with home ported vessels
Level of fishing landed port ($) = Landed value of fisheries landed in location)

ii.Recreational

Recreational fishing is available both near-shore and deep-sea from Sea Isle City. Many Recreational boats that depart from Sea Isle City are members of the Cape May County Party and Charter Boat Association. The *Capt. Robbins*, under Captain John Sullivan, departs from Ludlum Landing Road and fishes for sea bass, blackfish and flounder, spring through fall. The *Starfish*, Capt. Bob Rush Jr., offers day and night fishing for bluefish, flounder, sea bass, weakfish, and shark, as well as nature cruises where it nets many benthic and pelagic species. The charter boat *Ursula*, run by Capt. John Pratt, offers whale watching and sightseeing tours. Surfcasting is also popular in Sea Isle City, at beach locations at 93rd Street and North of 20th Street, and fishing piers at 59th Street and Sounds Avenue (Shore Internet nd).

In New Jersey, the charter/party fleet is the largest on east coast. Many vessels are over 120ft long and carry over 150 people.322

iii.Subsistence

Information on subsistence fishing in Sea Isle City is either unavailable through secondary data collection or the practice does not exist.

aa. Future

Sea Isle City, like most places of the New Jersey Shore, experiences severe annual coastal zone erosion. Erosion and other coastal hazards threaten the physical structure and livelihood of communities, pressing for continued development of coastal zone management (Psuty and Ofiara 2002).

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321 The Owner-City from the permit files is technically the address at which the owner receives mail concerning their permitted vessels, which could reflect the actual location of residence, the mailing address as distinct from residence, owner business location, or the address at which a subsidiary receives mail about the permits.

322 Community Review Comments, Bruce Freeman, NJ Coast Anglers Association, October 2, 2007

US Census Bureau. 2000b. Poverty thresholds 2000 [cited Jun 2007]. Available at: http://www.census.gov/hhes/www/poverty/threshld/thresh00.html
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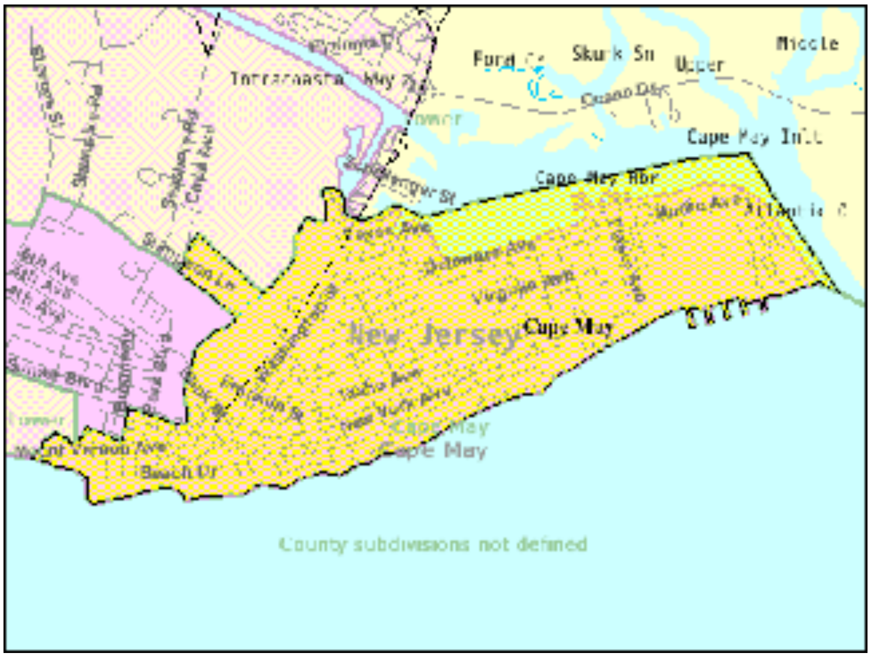
r. CAPE MAY, NJ[323]

Community Profile[324]

People and Places

Regional orientation

The city of Cape May, New Jersey (38.94°N, 74.91°W), is located in Cape May County (see Map 1). It is at the southern tip of the state of New Jersey on Cape Island at the end of Cape May Peninsula, with the Atlantic Ocean to the east and Delaware Bay to the west (USGS 2008).



Map 1. Location of Cape May, NJ (US Census Bureau 2000a)

Historical/Background

Cape May is part of Cape Island at the southern tip of Cape May Peninsula. The island was artificially created in 1942 when the U.S. Army Corps of Engineers dredged a canal that passes through to the Delaware Bay (City of Cape May nd). Fishing and farming have been important in this area since its beginnings, and whaling, introduced by the Dutch, was a significant industry in Cape May for roughly a century beginning in the mid-1600s. In the 18th century, this area became a summer resort for wealthy residents of Philadelphia wishing to escape the crowded city during the summer months, and is known as "America's oldest seaside resort." Because of this history and because of a fire that destroyed much of the city in 1878, Cape May has numerous Victorian homes and hotels, and was declared a National Historic Landmark City in 1976 (Cape Publishing 2005). "Today commercial fishing is

323 These community profiles have been created to serve as port descriptions in Environmental Impact Statements (EISs) for fisheries management actions. They also provide baseline information from which to begin research for Social Impact Assessments (SIAs). Further, they provide information relevant to general community impacts for National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and information on minorities and low income populations for Executive Order (E.O.) 12898 on Environmental Justice.
324 For purposes of citation please use the following template: "Community Profile of *Town, ST*. Prepared under the auspices of the National Marine Fisheries Service, Northeast Fisheries Science Center. For further information contact Lisa.L.Colburn@noaa.gov."

still the backbone of the county and is the second largest industry in Cape May County. The port of Cape May is considered one of the largest and busiest seaports along the eastern seaboard and generates more than $500 million annually"(Cape May County nd).

Demographics325

According to the Census 2000 data326, Cape May had a total population of 4,034, down from a reported population of 4,668 in 1990 (US Census Bureau 1990). Of this total in 2000, 49.3% were males and 50.7% were females. The median age was 47.4 years and 77.7% of the population was 21 years or older while 32.4% were 62 or older.

Cape May's population structure by age group (see Figure 1) was similar for all age categories. However, men were dominant for the population between 0 and 29 years, and then the population for male and female was the same until age 40 when it switched to female dominance through 80 years and over. Further, unlike the U.S. as a whole, the middle years are overall in lower percentages than the youngest and oldest. This large number of males in the 20-29 age bracket followed by a drop in the ages 30-59 is also very unlike most other fishing communities.

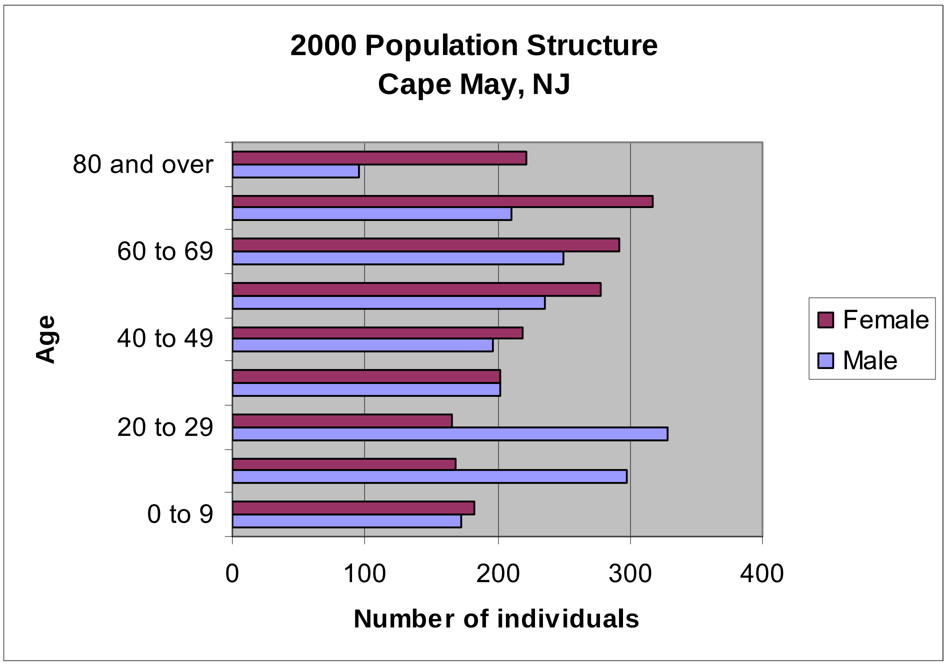


Figure 1. Cape May's population structure by sex in 2000 (US Census Bureau 2000a)

The vast majority of the population of Cape May in 2000 was white (91.0%), with 5.9% black or African American, 0.6% Native American or Alaskan, 0.8% Asian, and 0.07% Pacific Islander or Hawaiian (see Figure 2). Only 3.8% of the population identified themselves as Hispanic/Latino (see Figure 3). Residents linked their heritage to a number of European ancestries including: Irish (26.9%), German (21.9%), English (16.2%), Italian (14.2%), Polish (6.9%), French (3.5%), and Scottish (2.7%). With regard to region of birth, 25.6% of residents were born in New Jersey, 66.9% were born in a different state, and 6.1% were born outside the U.S. (including 2.4% who were not United States citizens).

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325 While mid-term estimates are available for some larger communities, data from the 2000 Census are the only data universally available for the communities being profiled in the Northeast. Thus for cross-comparability we have used 2000 data even though these data may have changed significantly since 2000 for at least some communities.
326 These and all census data, unless otherwise referenced, can be found at http://factfinder.census.gov/home/saff/main.html; census data used are for Cape May city

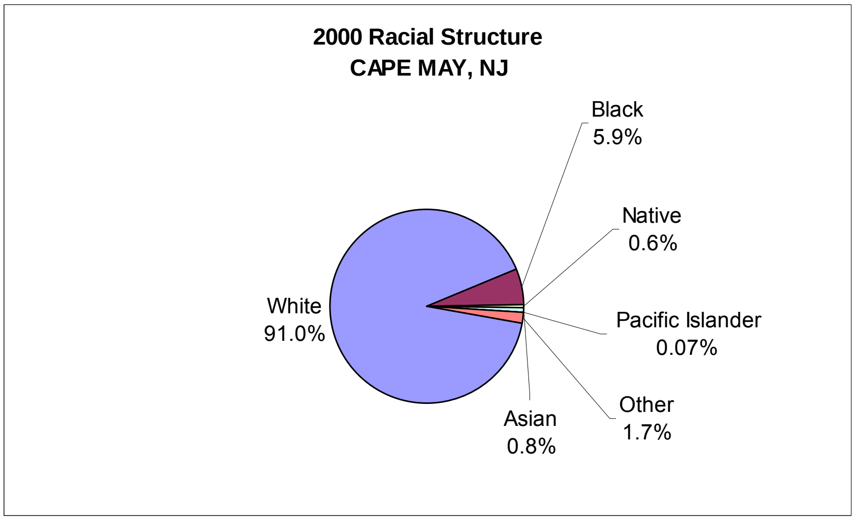

Figure 2. Racial Structure in 2000 (US Census Bureau 2000a)

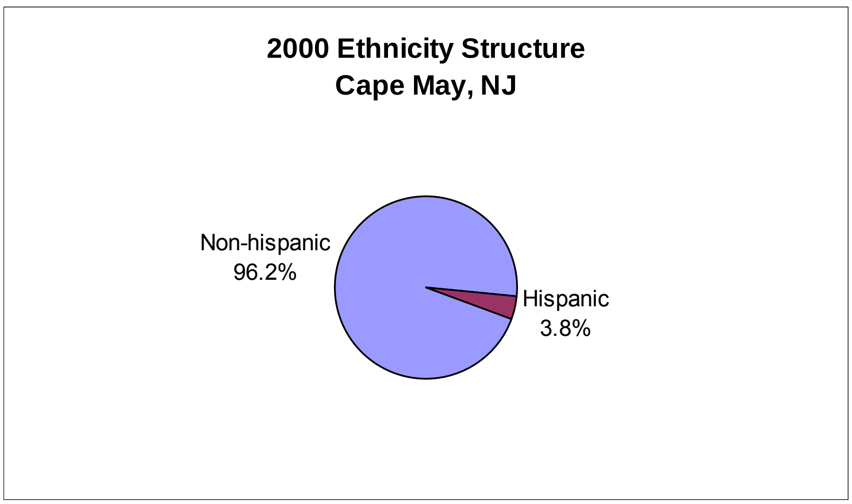

Figure 3. Ethnic Structure in 2000 (US Census Bureau 2000)

For 91.1% of the population in 2000, only English was spoken in the home, leaving 8.9% in homes where a language other than English was spoken, including 2.9% of the population who spoke English less than "very well" according to the US Census Bureau.

Of the population 25 years and over, 87.6% were high school graduates or higher and 30.8% had a bachelor's degree or higher. Again of the population 25 years and over, 2.6% did not reach ninth grade, 9.8% attended some high school but did not graduate, 30.5% completed high school, 20.1% had some college with no degree, 6.2% received an associate's degree, 19.0% earned a bachelor's degree, and 11.8% received a graduate or professional degree.

Although religious percentages are not available through U.S. Census data, according to the Association of Religion Data Archive in 2000 the religion with the highest number of congregations in Cape May County was Catholic, with 15 congregations and 32,307 adherents. Other prominent congregations were United Methodist (25 with 5,133 adherents), Episcopal (6 with 1,588 adherents) and Evangelical Lutheran Church in America (6 with 2,142 adherents). The total number of adherents to any religion was up 15% from 1990 (ARDA 2000).

Issues/Processes

Offshore wind farms have been proposed for four locations off of Cape May County, and fishermen are concerned about the impact wind turbines could potentially have on the fish or on their access to the fisheries (AP

2005). In 2006, rising fuel costs were having a detrimental effect on the charter fishing industry, especially on those boats going further out to go canyon fishing. The boat owners have been forced to raise their prices, and many potential customers were thinking twice about taking a trip offshore (McCann 2006).

Like in many other fishing communities with a significant tourism industry, commercial fishermen in Cape May are often competing with recreational fishing and with residential development for space. Lower Township, the municipality where the fishing industry is based, currently has three "marine development" zones in place, which are mostly used by recreational businesses; Schellenger's Landing, where much of the commercial fishing industry is based, is specially zoned for "marine general business" to permit expansion of the fishing-related businesses located here (McCay and Cieri 2000).

Cultural attributes

The Lobster House dock and fish packing plant operates a 45-minute tour to teach visitors about Cape May's commercial fishing industry (CMCDT nd). The Cape May County Fishing Tournament is one of the longest continuously running fishing tournaments on the East Coast (Cape May County nd). Cape May has a fisherman's memorial, with a woman and child looking out to sea, which was created thanks to a now defunct fishermen's wives association (McCay and Cieri 2000). Cape May County holds an annual seafood festival each July (Cape May Lewes nd); the commercial fishing industry reportedly has little involvement in the festival (McCay and Cieri 2000). A significant seafood festival is being organized (August 2007) to promote Cape May seafood as well as preparing for the Annual Seafood Cook-off held in New Orleans, LA. The Garden State Seafood Association is helping to coordinate this event along with many local restaurants and other groups throughout the state.327

Infrastructure

Current Economy

"Like many Jersey Shore communities, much of Cape May's and Wildwood's economies are dependent on seasonal tourism - which is dependent both on the weather and the overall state of the economy. The year-round character of commercial fishing is a major factor in keeping these communities going in the off-season" (CMCPCBA nd). Commercial fishing is the second largest industry in Cape May County after tourism (CMCDT nd). The tenth largest employer (140 employees) in Cape May County is Snow's/Doxsee Inc. (NJDA nd; CMCCC nd), with an 86,000 square-foot plant in Cape May that produces clam products including chowder, soups, canned clams, clam juice, and seafood sauces. Cold Spring Fish and Supply employs 500 people, and is the third largest employer in the county. Other top employers in the county include Burdette Tomlin Memorial Hospital (now the Cape Regional Medical Center) (1100), Acme Markets (600), WaWa (485), Holy Redeemer Visiting Nurse (250), and Super Fresh (250) (CMCCC nd). Cape May also has the only basic training facility for the U.S. Coast Guard (USMilitary.com 2007).

According to the U.S. Census 2000, 57.5% (1,985 individuals) of the total population over 16 years of age and over was in the labor force (Figure 4), of which 3.8% were unemployed, 14.2% were in the armed forces, and 39.5% were employed.

According to the U.S. Census 2000328, jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 5 positions or 0.4% of all jobs. S elf employed workers, a category where fishermen might be found, accounted for 205 positions or 15% of jobs. Arts, entertainment, recreation, accommodation and food services (21.1%), retail trade (16.4%), and educational, health and social services (13.6 %), and finance, insurance, real estate and rental and leasing (10.6%) were the primary industries.

327 Community Reviewer Comments; Greg DiDomenico, Garden State Seafood Association. Comments received August 24, 2007.

328 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

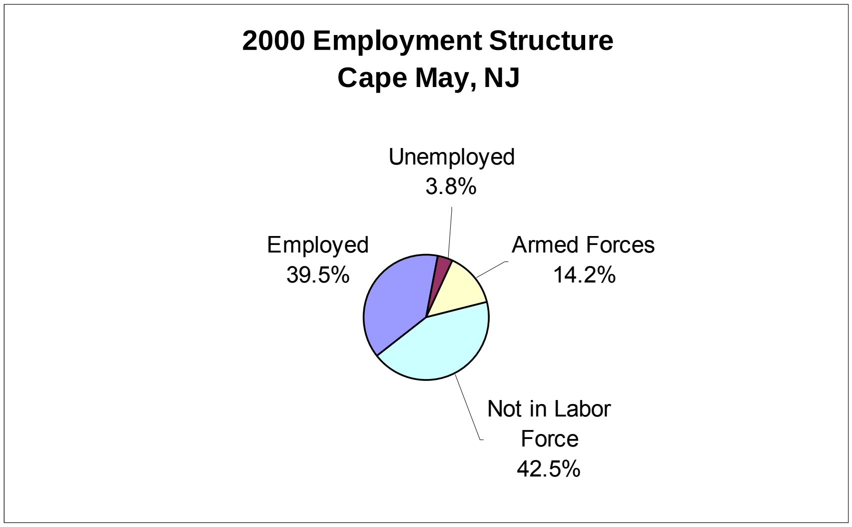

Figure 4. Employment Structure in 2000 (US Census Bureau 2000a)

Median household income in Cape May in 2000 was $33,462 (up 21.4% from $27,560 in 1990 [US Census Bureau 1990]) and median per capita income was $29,902. For full-time year round workers, males made approximately 13.0% more per year than females.

The average family in Cape May in 2000 consisted of 2.69 persons. With respect to poverty, 7.7% of families (up from 2.7% in 1990 [US Census Bureau 1990]) and 9.1% of individuals were below the U.S. Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families, depending on number of persons (2-9) (US Census Bureau 2000b). In 2000, 36.7% of all families in Cape May (of any size) earned less than $35,000 per year.

In 2000, Cape May had a total of 4,064 housing units, of which 44.8% were occupied and 40.8% were detached one unit homes. Fewer than a third (29.1%) of these homes were built before 1940. Mobile homes and boats accounted for only 0.3% of the total housing units; 82.3% of detached units had between 2 and 9 rooms. In 2000, the median cost for a home in this area was $212,900. Of vacant housing units, 93.1% were used for seasonal, recreational, or occasional use. Of occupied units, 43.2% were renter occupied.

Government

The City of Cape May operates under the Council/Manager form of government. Cape May voters directly elect the Mayor. The person elected serves a four year term. The mayor presides over the council and has a vote. There are four members of Council, in addition to the Mayor. Their terms are staggered, where the members of the first council draw lots to determine who serves a four year term. The remaining three will serve a two year term. Subsequently, all councilmen elected serve for four years (City of Cape May nd).

Fishery involvement in government

The Cape May County Planning Board expresses in its comprehensive plan its policies regarding commercial fishing, which include promoting and encouraging land use policies which benefit the commercial fishing industry and protecting the fishing industry from economic or environmental harm by opposing projects which may have a negative effect (Cape May County nd).

NOAA Fisheries Statistics Office has port agents based in Cape May. Port agents sample fish landings and provide a ‘finger-on-the-pulse’ of their respective fishing communities (NOAA FSO nd).

Institutional

Fishing associations

Garden State Seafood Association (GSSA) in Trenton is a statewide organization of commercial fishermen and fishing companies, related businesses and individuals working in common cause to promote the interests of the commercial fishing industry and seafood consumers in New Jersey. Lunds, Atlantic Capes, and Cold Spring are all members of the GSSA. Lunds and Atlantic Capes are founding contributors of the National Fisheries Institute, Scientific Monitoring Committee, which raises millions of dollars through the Research Set-Aside Program. Rutgers University is a major contributor to these science-based efforts and has an office in Cape May.[329]

The Jersey Coast Anglers Association (JCAA) is an association of over 75 saltwater fishing clubs throughout the state. Founded in 1981, the purpose of the organization is to unite and represent marine sport anglers to work towards common goals. The JCAA website (www.jcaa.org) also provides links for many NJ anglers associations.

Fishery assistance centers

The Cape May County government, along with the State of New Jersey, developed the Cape May County Revolving Fishing Loan Program. Instituted in 1984, it is designed “to help commercial, charter and party boat fishermen with low interest loans for safety and maintenance of fishing vessels.” More than $2.5 million has been loaned to date (Cape May County nd). The Cape May County Technical School integrates projects such as commercial fishing net mending and gear construction and operating a fish market in their curriculum to prepare students for careers in the commercial fishing industry (CMCTSD nd).

Other fishing related organizations

The Cape May County Party and Charter Boat Association is an organization of small recreational fishing boats located along the coast of Southern New Jersey. The Cape May Marlin & Tuna Club hosts several tournaments throughout the year.

Physical

Cape May, like all of New Jersey's seafood industry, is within easy reach of airports in Newark, New York and Philadelphia. All these offer next-day service for fresh seafood to virtually every major market in the world. The container port in Newark/Elizabeth handles hundreds of thousands of shipping containers each month, many of them packed with chilled or frozen food products (NJ Fishing nd). Cape May also has extensive bus service to the surrounding area as well as Philadelphia and Atlantic City (NJ Transit nd). There is also a ferry terminal connecting Cape May to Lewes, DE. It is 48 miles from Atlantic City, NJ, 87 miles from Philadelphia, PA, and 169 miles from New York City.

Commercial and recreational fishing docks are scattered around Cape May or, more properly, Lower Township, but centered in an area known as Ocean Drive (McCay and Cieri 2000), “a road which leaves the main highway and crosses the marshes toward the Diamond Beach section of Lower Township and Wildwood Crest, and Schellenger's Landing, just over a large bridge that connects the mainland with the center of Cape May and its beaches.”[330] The fishing industry is really based in Lower Township, rather than within Cape May proper. Schellenger’s Landing has a dock and fish market; a number of large vessels are located here. In the vicinity are also a marine railway, two marinas, two bait and tackle shops, two marine suppliers, and a “marlin and tuna club”. Some commercial fishing boats also use Cape May’s recreational marinas (McCay and Cieri 2000). Two Mile Landing is a marina with recreational boats and a restaurant; some commercial fishing activity is found here as well (McCay and Cieri 2000).

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329 Community Reviewer Comments; Greg DiDomenico, Garden State Seafood Association. Received Aug 24, 2007.
330 Community Reviewer Comments, James Smith, Cape May County Planning. Comments received September 12, 2007.

Involvement in Northeast Fisheries331

Commercial

The combined port of Cape May/Wildwood is the largest commercial fishing port in New Jersey and is one of the largest on the East Coast. Cape May/Wildwood is the center of fish processing and freezing in New Jersey. Some of the largest vessels fishing on the East Coast are home ported here. Cape May fishing vessels have frequently been responsible for developing new fisheries and new domestic and international markets. The targeted species are diverse; fisheries focus on squid, mackerel, fluke, sea bass, porgies, lobsters and menhaden. Some of the boats out of Wildwood are also targeting surf clams and ocean quahogs (NJ Fishing nd).

F.H. Snow's Canning Co/Doxsee is a large clam cannery based in Lower Township (not Cape May)332, and the only domestic manufacturer to harvest its own clams. Snow's/Doxsee has the nation's largest allocation for fishing and harvesting ocean clams. Established in 1954 in Cape May, Lund's Fisheries, Inc., is a freezer plant and a primary producer of various species of fish found along the Eastern Seaboard of the USA. It is also a member of the Garden State Seafood Association. There is one other exporter of seafood in Lower Township333, the Atlantic Cape Fisheries Inc. which exports marine fish and shellfish, oysters, scallops, clams and squids (NJDA nd). The Axelsson and Johnson Fish Company Inc. which used to export shad, marine fish, conch, American lobster, lobster tails, scallops and whole squid went out of business several years before the creation of this profile.334

The top species landed in Cape May in 2006 were scallops (over $23 million), squid, mackerel, butterfish (over $12 million) and summer flounder, scup, and black sea bass (over $1.9 million) (Table 1). Between 1997 and 2006 home ported vessels increased from 109 to 184 while the number of vessels whose owner's city was Cape May also increased from 73 to 88 vessels. Additionally, home port value and landed port value also steadily increased over the same time period, with the exception of a decline in the later category in 2006 (Table 2).

Cape May is 3rd of the 4 towns with 5% or more of all skate permits by either homeport (6.3%) or owner's town of residence (3.3%). It is interesting that Cape May has so many permits, as it has a relatively low level of landings. In 2007 it ranked 24th in terms of skate value and 17th in terms of skate pounds. There were 4 skate dealers in Cape May in 2007, none of them receiving more than 5% of their income from skate. There is a mixed monkfish/skate fishery off northern New Jersey, near Point Pleasant.

Landings by Species

Table 1. Dollar value of Federally Managed Groups of Landings for Cape May

	Average from 1997-2006	2006 only
Scallop	22,263,937	23,677,160
Squid, Mackerel, Butterfish	7,584,550	12,375,958
Summer Flounder, Scup, Black Sea Bass	2,044,420	1,979,899
Other335	1,696,617	1,637,321

331 In reviewing the commercial landings data several factors need to be kept in mind. 1) While both federal and state landings are included, some states provide more detailed data to NMFS than others. For example, shellfish may not be included or data may be reported only by county and not by port. 2) Some communities did not have individual port codes until more recently. Before individual port codes were assigned, landings from those ports were coded at the county level or as an aggregate of two geographically close small ports. Where landings were coded at the county level they cannot be sorted to individual ports for those earlier years, e.g., prior to 2000. 3) Where aggregated codes were used, those aggregate codes may still exist and be in use alongside the new individual codes. Here the landings which are still assigned to the aggregate port code cannot be sorted into the individual ports, so port level data are only those which used the individual port code. 4) Even when individual port codes exist, especially for small ports, landings may be coded at the county level. Here again it is impossible to disaggregate these to a port level, making the port level landings incomplete. 5) In all these cases, the per port data in this profile may under report the total level of landings to the port, though all landings are accounted for in the overall NMFS database.

332 Community Reviewer Comments, James Smith, Cape May County Planning. Comments received September 12, 2007.

333 Community Reviewer Comments, James Smith, Cape May County Planning. Comments received September 12, 2007.

334 Community reviewer comments; Walter Makowski, NMFS Port Agent, comments received August 8, 2007.

335 "Other" species includes any species not accounted for in a federally managed group

	Average from 1997-2006	2006 only
Surf Clams, Ocean Quahog	588,296	0
Lobster	420,312	8,861
Herring	412,103	2,896,122
Monkfish	322,895	397,841
Red Crab	40,358	0
Smallmesh Groundfish336	23,939	2,997
Bluefish	20,626	4,267
Skate	12,299	4,387
Largemesh Groundfish337	8,067	3,705
Dogfish	6,574	0
Tilefish	597	1,230

Vessels by Year338

Table 23. All columns represent vessel permits or landings value combined between 1997-2006

Year	# Vessels (home ported)	# Vessels (owner's city)	Level of fishing home port ($)	Level of fishing landed port ($)
1997	109	73	27,687,667	23,636,983
1998	105	68	27,614,763	25,770,007
1999	106	72	29,153,706	22,353,284
2000	116	74	30,488,271	23,936,235
2001	116	71	32,923,798	27,155,864
2002	118	72	34,529,920	28,312,296
2003	129	78	42,777,501	36,372,658
2004	135	73	62,308,441	60,630,752
2005	155	82	69,641,897	63,298,068
2006	184	88	75,058,370	42,989,748

 # Vessels home ported = No. of permitted vessels with location as homeport
 # Vessels (owner's city) = No. of permitted vessels with location as owner residence339
Level of fishing home port ($) = Landed value of fisheries associated with home ported vessels
Level of fishing landed port ($) = Landed value of fisheries landed in location

Recreational

In NJ the charter/party fleet is the largest on east coast. Many vessels are over 120ft long and carry over 150 people.340 The Cape May County Party and Charter Boat Association lists several dozen charter and party

336 Smallmesh Multi-Species: red hake, ocean pout, mixed hake, black whiting, silver hake (whiting)
337 Largemesh Groundfish: cod, winter flounder, yellowtail flounder, American plaice, sand-dab flounder, haddock, white hake, redfish, and pollock
338 Numbers of vessels by owner's city and homeport are as reported by the permit holder on permit application forms. These may not correspond to the port where a vessel lands or even spends the majority of its time when docked.
339 The Owner-City from the permit files is technically the address at which the owner receives mail concerning their permitted vessels, which could reflect the actual location of residence, the mailing address as distinct from residence, owner business location, or the address at which a subsidiary receives mail about the permits.
340 Community Review Comments, Bruce Freeman, NJ Coast Anglers Association, October 2, 2007

vessels based out of the City of Cape May. There are 35 vessels listed carrying 1-6 passengers, six vessels which can carry more than six passengers, and three party boats (NJ Fishing nd). The Miss Chris fleet of party boats makes both full- and half-day trips, targeting largely fluke and stripers for most of the year. The Porgy IV, another party boat, targets sea bass, blackfish, and flounder. Many of the charter boats go offshore canyon fishing (McCay and Cieri 2000). Between 2001- 2005, there were 56 charter and party vessels making 6,599 total trips registered in NMFS logbook data by charter and party vessels in Cape May, carrying a total of 116,917 anglers (NMFS VTR data). There are several fishing tournaments held throughout the year sponsored by the Cape May Marlin and Tuna Club.

Subsistence

Information on subsistence fishing in Cape May is either available through primary data collection or the practice does not exist.

FUTURE

Information on the future in Cape May was unavailable through secondary data collection.

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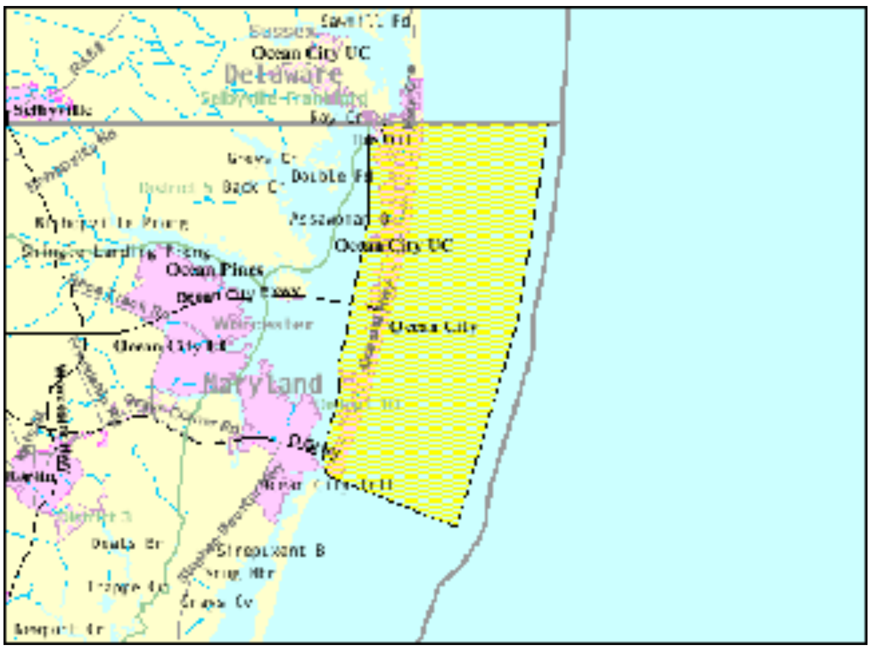
s. OCEAN CITY, MD[341]

Community Profile[342]

People and Places

Regional orientation

Ocean City, Maryland (38.33º N, 75.09º W) is a town located in Worcester County, in Ocean Pines, an unincorporated area in the County. It is bordered to the east by the Atlantic Ocean and to the west by the Assawoman Bay and Isle of Wight Bays. The town has a total area of 36.4 mi^2, 4.6 mi^2 of that is land and 31.8 mi^2 is water (USGS 2008). West Ocean City is across the bay from the southern portion of Ocean City.



Map 1. Location of Ocean City, MD (US Census Bureau 2000a)

Historical/Background

The first European came to Ocean City in 1524 from France, but the town wasn't truly settled until the late 17th century with an influx of Virginians from the Eastern Shore. The area of land belonging today to Worcester county Maryland changed many times over the years, belonging at times to Delaware and Somerset County, Maryland. In 1869, a man named Isaac Coffin came to Ocean City and built a cottage to house guests who wanted to go to the beach or to fish. People quickly came and the area became a popular summer resort, eventually adding dancing and amusements. In 1933, a storm formed the Ocean City Inlet and engineers decided to make this act of nature permanent. This decision helped to establish Ocean City as an important fishing port, offering easy access to

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341 These community profiles have been created to serve as port descriptions in Environmental Impact Statements (EISs) for fisheries management actions. They also provide baseline information from which to begin research for Social Impact Assessments (SIAs). Further, they provide information relevant to general community impacts for National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and information on minorities and low income populations for Executive Order (E.O.) 12898 on Environmental Justice.

342 For purposes of citation please use the following template: "Community Profile of *Town, ST*. Prepared under the auspices of the National Marine Fisheries Service, Northeast Fisheries Science Center. For further information contact Lisa.L.Colburn@noaa.gov."

both the bay and the Atlantic Ocean (OCCVB n.d.). Most of the fishing today is offshore, however there are substantial inshore and coastal bay fisheries (blue crabs, hard clams, and gillnetting for spot, bunker, trout, and striped bass).343 West Ocean City, while on the other side of the bay and not part of the town, is generally not considered by locals to be a distinct entity from Ocean City.344

Demographics**345**

Ocean City – According to the Census 2000 data, Ocean City town had a population of 7,173, up 41.4% from a reported population of 5,074 in 1990 (US Census Bureau 1990). Of this 2000 total, 51.3% were males and 48.7% were females. The median age was 47.2 years and 86.5% of the population was 21 years or older while 30.0% of the population was 62 or older.

The population structure for Ocean City (see Figure 1) showed an older population, with the largest percentage of residents between the ages 60-69, and significant numbers of residents in the 50-59 and 70-79 age categories. This indicates that many people may retire to Ocean City. There were also, however, a significant number of residents between the ages of 20-49 as well. Ocean City had surprisingly few children in the 0-9 and 10-19 age categories.

The majority of the population was white (96.3%) with 2.5% black or African America, 0.7% Asian, 0.1% Native American, and 0.01% Native Hawaiian or Pacific Islander (see Figure 2). Of the total population, 1.2% identified themselves as Hispanic/Latino (see Figure 3). Residents linked their backgrounds to a number of different ancestries including: German (25.6%), Irish (21.0%), English (16.0%), and Italian (8.7%).

With regard to region of birth, 51.5% were born in Maryland, 43.7% were born in a different state and 4.5% were born outside of the U.S. (including 3.0% who were not United States citizens).

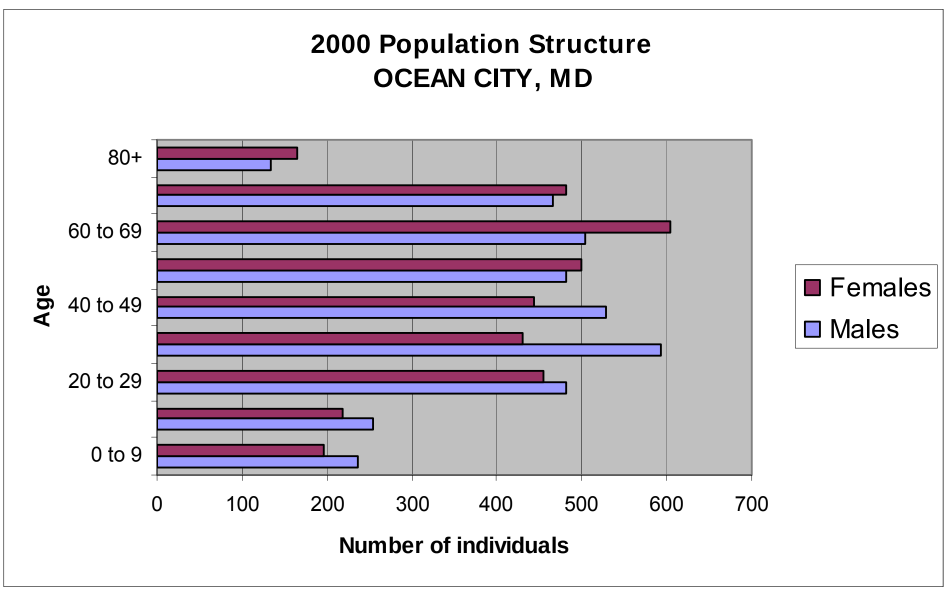

Figure 1. Ocean City's population structure by sex in 2000 (US Census Bureau 2000)

343 Community Review comments, Dave Blazer, Executive Director, Maryland Coastal Bays, October 12, 2007
344 Pers comm, Walter Makowski, NMFS Port agent.
345 While mid-term estimates are available for some larger communities, data from the 2000 Census are the only data universally available for the communities being profiled in the Northeast. Thus for cross-comparability we have used 2000 data even though these data may have changed significantly since 2000 for at least some communities.

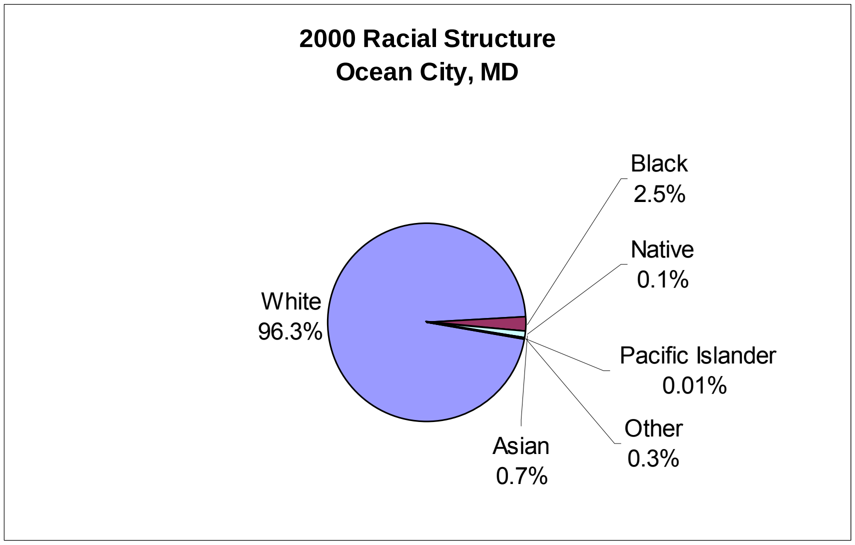

Figure 2. Racial Structure in 2000 (US Census Bureau 2000)

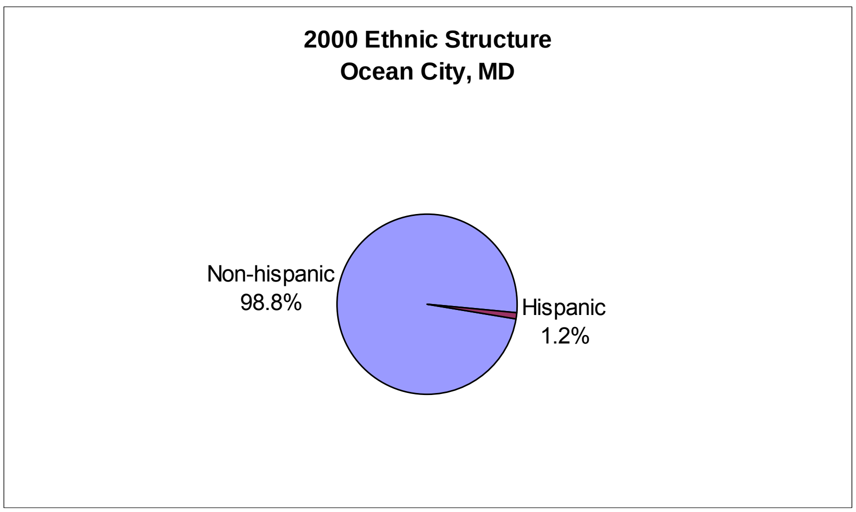

Figure 3. Ethnic Structure in 2000 (US Census Bureau 2000)

For 93.0% of the population in 2000, only English was spoken in the home, leaving 7.0% in homes where a language other than English was spoken, including 2.9% of the population who spoke English less than "very well" according to the 2000 Census.

Of the population 25 years and over, 87.1% were high school graduates or higher and 28.0% had a bachelor's degree or higher. Again of the population 25 years and over, 2.6% did not reach ninth grade, 10.3% attended some high school but did not graduate, 31.7% completed high school, 22.7% had some college with no degree, 4.8% received their associate's degree, 20.1% earned their bachelor's degree, and 7.9% received either their graduate or professional degree.

<u>West Ocean City CDP</u> – According to the Census 2000 data, West Ocean City CDP had a population of 3,311, up 65.5% from a reported population of 2,000 in 1990 (US Census Bureau 1990). Of this total in 2000, 49.3% were males and 50.7% were females. The median age was 43.5 years and 77.9% of the population was 21 years or older while 23.3% of the population was 62 or older.

The population structure for West Ocean City (see Figure 4) showed essentially two peaks; the first was between ages 30-39, and the second between ages 60-69. Interestingly, men between the ages of 30-39 outnumbered women of the same age, and conversely women aged 60-69 out-numbered their male counterparts. This patterns suggests two possible trends; one is that younger adults, and particularly males without children aged

20-39 are moving to West Ocean City, and the other is that many people are retiring here, judging by the large number of residents in the 60-69 and 70-79 age categories. There were not many children in West Ocean City, compared to what one might expect to see considering the number of residents here.

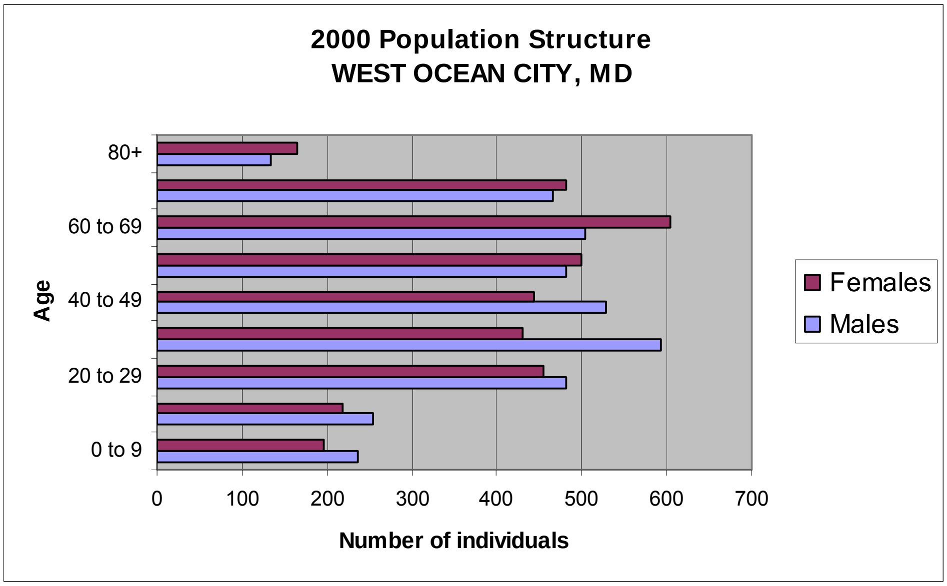

Figure 4. Ocean City's population structure by sex in 2000

The majority of the population of West Ocean City in 2000 was white (95.9%) with 2.0% of residents black or African American, 0.8% Native American, 1.0% Asian, and 0.1% Pacific Islander or Hawaiian (see Figure 5). Of the total population, only 1.4% identified themselves as Hispanic/Latino (see Figure 6). Residents linked their backgrounds to a number of different ancestries including: German (22.1%), English (19.0%), and Irish (16.7%).

With regard to region of birth, 57.2% were born in Maryland, 38.2% were born in a different state and 4.4% were born outside of the U.S. (including 2.2% who were not United States citizens).

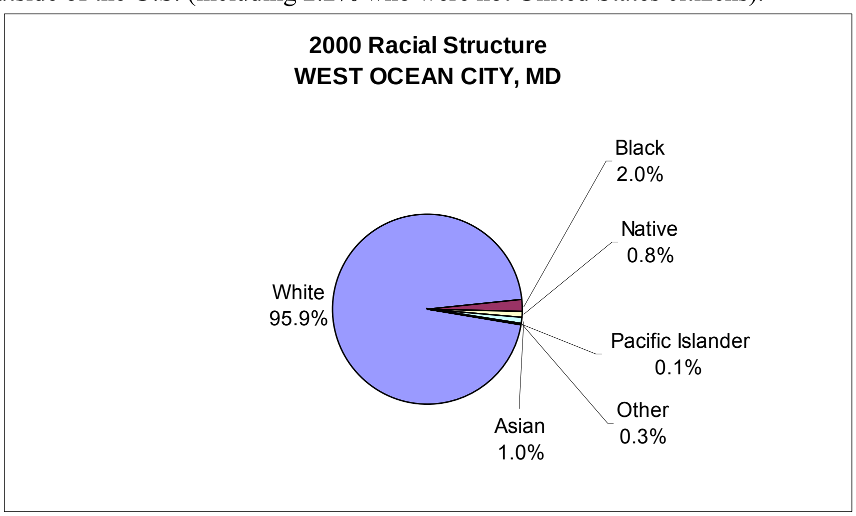

Figure 5. Racial Structure in 2000 (US Census Bureau 2000)

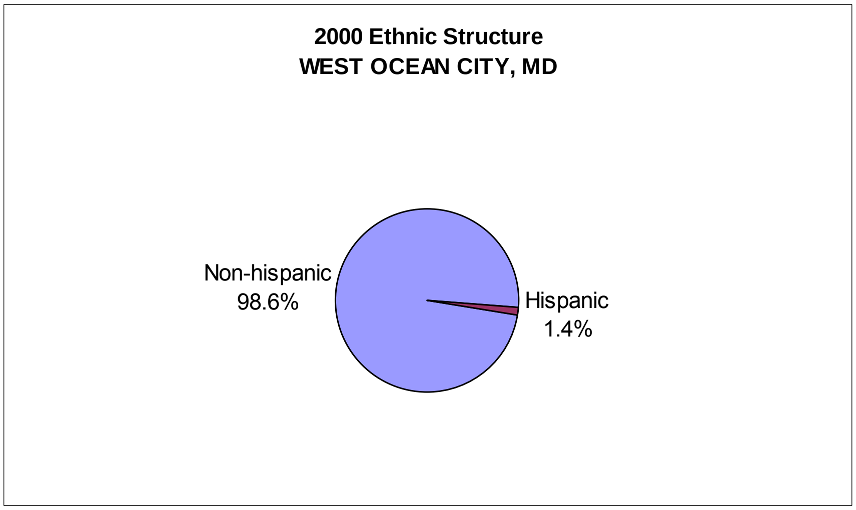

Figure 6. Ethnic Structure in 2000 (US Census Bureau 2000)

For 93.2% of the population, only English was spoken in the home, leaving 6.8% in homes where a language other than English was spoken, including 2.8% of the population who spoke English less than "very well" according to 2000 Census.

Of the population 25 years and over, 81.2% were high school graduates or higher and 20.7% had a bachelor's degree or higher. Again of the population 25 years and over, 3.6% did not reach ninth grade, 15.2% attended some high school but did not graduate, 31.5% completed high school, 21.1% had some college with no degree, 7.9% received their associate's degree, 12.6% earned their bachelor's degree, and 8.1% received either their graduate or professional degree.

Although religious percentages are not available through U.S. Census data, according to the Association of Religion Data Archives (ARDA) in 2000, the religions with the highest number of congregations in Worcester County included Catholic with 5 congregations and 7,700 adherents. Other prominent congregations in the county were United Methodist (39 with 7,628 adherents) and Southern Baptist Convention (8 with 3,009 adherents). The total number of adherents to any religion was up 59.6% from 1990 (ARDA 2000).

Issues and Processes

Ocean City is primarily a resort town. The real estate market has long been a problem for those seeking to buy a first home, especially blue collar workers (Lerner 2002, Guy 2003, Vandiver 2004). Many people are also concerned about aquaculture developing in the area. They are concerned that if it does develop, it will be run by the large poultry companies in the area, as has happened in areas further to the south (McCay and Cieri 2000:90). Also a concern with respect to aquaculture is competition for space and resources. Concerns are also present regarding allocation of marine resources between the commercial and recreational sectors, as well as potential commercial fishing gear impacts on habitat in the area.346

Dock space in West Ocean City, where the commercial fishing fleet is based, is limited; fortunately protective zoning by Worcester County means the docks are not immediately threatened. Some processing plants and a clam dock in the area recently closed as a result of a consolidation of surf clam and ocean quahog boats, particularly a decline in owner-operated boats, after the implementation of ITQs in this fishery (Oles 2003).

Cultural attributes

Ocean City hosts many fishing tournaments each year. In 2006, the tournaments began in June with the Mako Mania Shark Tournament. In July comes the Ocean City Tuna Tournament, which features nightly weigh-ins as well as food, entertainment, crafts and fishing related games for children. In August, the town hosts the world's largest billfish tournament, the White Marlin Open, which offers cash prizes for white marlin, blue marlin, tuna,

346 Community Review comments, Dave Blazer, Executive Director, Maryland Coastal Bays, October 12, 2007

wahoo, dolphin and shark; nightly weigh-ins are a popular event. In 2006, $2.3 million was given away in prizes. Later in the month is the only local Ladies Only fishing tournament, Captain Steve Harman Poor Girl's Open Fishing Tournament. In September the Mid-Atlantic Bartenders Open Fishing Tournament is another popular event (Ocean City 2008). Other tournaments are held as well, many hosted by The Ocean City Marlin Club.

Each year the Maryland Watermen's Association sponsors the East Coast Commercial Fishermen's and Aquaculture Trade Exposition in Ocean City, which features aquaculture and commercial fishing seminars, gear, equipment, and boats. The Seaside Boat Show is held in February. May brings the Annual White Marlin Festival and Crab Soup Cookoff (Town of Ocean City 2008). One of the fish docks in West Ocean City sponsored a "Mid-Atlantic Commercial Fishing Skills Contest", which included competitions in rope tying, net mending, rope splicing, survival suit-donning, and other fishing-related activities (Oles 2003). January brings the Nautical and Wildlife Art Festival and October brings Harbor Day at the Docks ~ a Waterfront Heritage Festival and Phillips Annual Seafood Dinner (OCCVB nd).

Infrastructure

Current Economy

Many of the people in the Ocean City area work in restaurants and hotels that have made this area popular with tourists. In fact, the six major employers in Ocean City are all in tourism and property management/development industries: Harrison Group (hotels), Phillips (restaurants/seafood), Bayshore Development (hotels, amusements), OC Seacrets, Inc. (night club), KTG LLC (restaurants), and Clarion Resort Fountainbleu (hotels).347

There are three packing houses in West Ocean City, which combined employ about sixteen people. There are probably at least 230 people employed on the charter and party boats in Ocean City, not including additional support staff or those that work at related businesses like bait and tackle shops. Recreational fishing is one of the more important aspects of Ocean City's tourist economy (Oles 2003). "Worcester County's 2,040 businesses employ 20,300 workers; an estimated 13 of these businesses have 100 or more workers. Chicken growing and processing is the major industry in Worcester County. Major private sector employers include Bel-Art Products [plastic components, laboratory equipment], Perdue Farms [poultry processing], and Tyson Foods, Inc [poultry processing]" (Worcester County 2008) [Tyson's was located in Berlin but closed down348]. Other major employers include Harrison Hotels, Atlantic General Hospital and Walmart (Worcester County 2008).

Ocean City – According to the U.S. Census 2000349, 60.4% (3,909 individuals) of the total population 16 years of age and over were in the labor force (see Figure 7), of which 5.6% were unemployed, 0.2% were in the Armed Forces, and 54.6% were employed.

347 Community Review comments; Jesse Houston, Director of Planning and Community Development, Town of Ocean City, October 10, 2007.
348 Community Review Comment, Donna Abbott, Public relations, Ocean City Department of Tourism, Oct 22, 2007
349 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

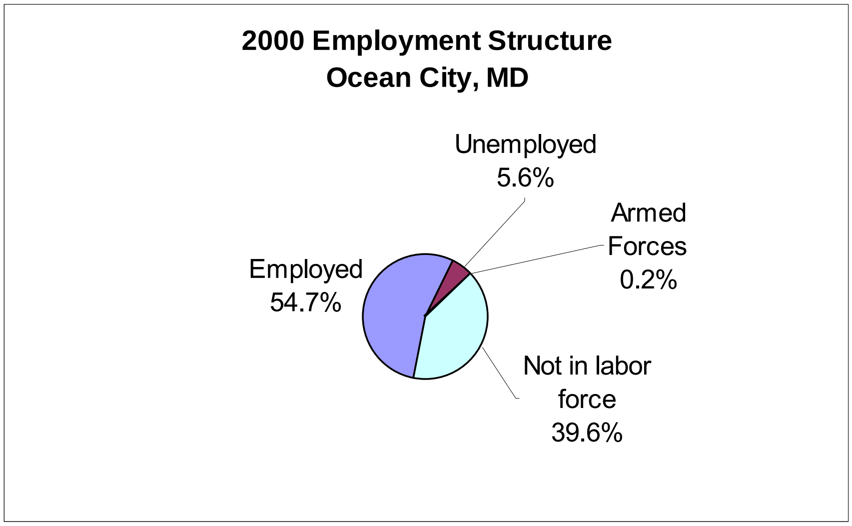

Figure 7. Employment Structure in 2000 (US Census Bureau 2000)

According to Census 2000 data, jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 12 positions or 0.3% of all jobs. Self employed workers, a category where fishermen might be found, accounted for 392 positions or 11.1% of jobs. Arts, entertainment, recreation, accommodation and food services (29.5%), retail trade (12.9%), finance, insurance, real estate, and rental and leasing (12.0%), and educational, health, and social services (11.1%) were the primary industries.

Median household income in Ocean City was $35,772, up 37.8% from $25,959 in 1990 (US Census Bureau) and median per capita income was $26,078. For full-time year round workers, males made approximately 4.2% more per year than females.

The average family in Ocean City consisted of 2.47 persons. With respect to poverty, 6.0% of families, down 6.4% from 1990 (US Census Bureau 1990) and 8.4% of individuals earned below the official U.S. Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families, depending on number of persons (2-9) (US Census Bureau 2000b). In 2000, 37.7% of all families of any size earned less than $35,000 per year.

In 2000, Ocean City had a total of 26,317 housing units of which 14.2% were occupied and 9.4% were detached one unit homes. A few (2.2%) of these homes were built before 1940. Mobile homes, boats, RVs, vans, etc. accounted for 6.9% of the total housing units; 96.9% of detached units had between 2 and 9 rooms. In 2000, the median cost for a home in this area was $152,200. Of vacant housing units, 54.3% were used for seasonal, recreational, or occasional use. Of occupied units, 32.6% were renter occupied.

<u>West Ocean City CDP</u> – According to the U.S. Census 2000, 61.9% (1,724 individuals) of the total population 16 years of age and over were in the labor force (see Figure 7), of which 4.2% were unemployed, none were in the Armed Forces, and 57.7% were employed.

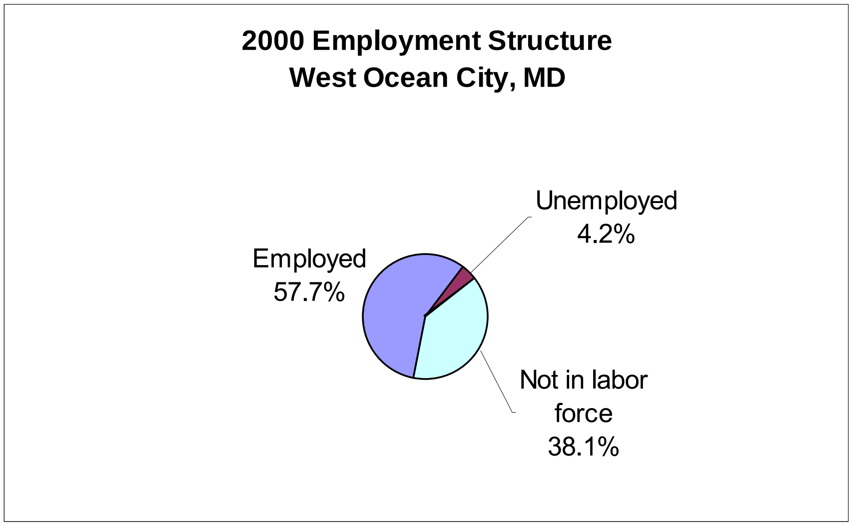

Figure 8. Employment structure in 2000 (US Census Bureau 2000)

According to Census 2000 data, jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 15 positions or 0.9% of all jobs. Self employed workers, a category where fishermen might be found, accounted for 145 positions or 9.0% of jobs. Arts, entertainment, recreation, accommodation and food services (24.1%), retail trade (15.8%), finance, insurance, real estate, and rental and leasing (11.6%), educational, health, and social services (10.7%), and construction (10.7%) were the primary industries.

Median household income in West Ocean City was $42,279, up 33.7% from $31,632 in 1990 (US Census Bureau 1990) and median per capita income was $28,132. For full-time year round workers, males made approximately 11.8% more per year than females.

The average family in West Ocean City consisted of 2.77 persons. With respect to poverty, 3.0% of families, down from 9.3% in 1990 (US Census Bureau 1990) and 5.0% of individuals earned below the official U.S. Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239 through $35,060 for families, depending on number of persons (2-9) (US Census Bureau 2000b). In 2000, 27.1% of all families (of any size) earned less than $35,000 per year.

In 2000, West Ocean City had a total of 2,075 housing units of which 68.7% were occupied and 77.0% were detached one unit homes. Less than 5% (3.1%)of these homes were built before 1940. Mobile homes accounted for 10.1% of the total housing units; 88.6% of detached units had between 2 and 9 rooms. In 2000, the median cost for a home in this area was $157,500. Of vacant housing units, 14.2% were used for seasonal, recreational, or occasional use. Of occupied units, 20.1% were renter occupied.

Government

Ocean City is run by a City Manager and Council form of government. The mayor and Town Council include a Council President, Council Secretary and five general Council Members (Town of Ocean City 2008). West Ocean City is governed by Worcester County, which has a seven-member board of County Commissioners (Worcester County 2008).

Fishery involvement in government

Worcester County manages a commercial dock in West Ocean City. The Worcester County Commission has zoned the harbor area here as a commercial marine district, to protect commercial fishing operations from being pushed out by condominiums and other private development. The Worcester County Comprehensive Development Plan (WCPC 2006) also recognizes commercial fishing as one of the County's economic assets (p. 31) and has a goal of preserving fisheries and their nurseries (p. 33) and has 5 goals specifically aimed at retaining commercial fishing and seafood processing in the County (p. 60). Ocean City's comprehensive plan encourages water uses on the bay and marina construction (Oles 2003). It also recognizes the importance of water quality and commercial fishing to the town (OCPB 2007).

The State of Maryland Division of Natural Resources (DNR) manages fisheries in Ocean City and West Ocean City. The DNR has a Coastal Fisheries Advisory Committee which provides advice on fishery issues, preparing management plans, and works to develop objectives and management options for specific fisheries. The Committee has representation from Ocean City, West Ocean City, and different fishing groups.350 Ocean City also has a harbor master.

Institutional

1. *Fishing associations*

There is a statewide fishermen's organization called the Maryland Watermen's Association (MWA) but few of the ocean fishermen belong to it because it emphasizes helping the Chesapeake Bay fishermen rather than the ocean fishermen. The organization focuses more on the Bay fishermen because there are more bay crabbers, clammers, and gill netters than there are ocean fishermen. However, the MWA still broadly represent all those who work on the water in/of Maryland. The President of the Association also serves on the Mid-Atlantic Fishery Management Council (MAFMC) which focuses on bay and ocean fisheries issues.351 The ocean fishermen are concerned that they are not prepared for what may happen and they lack representation (McCay and Cieri 2000). The Maryland Saltwater Sport Fishermen's Association also has a Chapter in Ocean City.352

There are some sportfishing groups in Ocean City that work to promote sportfishing in the area. One is the Ocean City Marlin Club, which began in 1936. The club is primarily a social one, although they are becoming increasingly political. They also host several tournaments. The OC Surf Anglers hosts surf fishing tournaments. The Ocean Pines Fishing Club is made up of members of Ocean Pines, a planned community in West Ocean City. The captains of the charter boats located at the Ocean City Fishing Center are all members of the Ocean City Charter Captain's Association (Oles 2003).

2. *Fishing assistance centers*

Information on fishery assistance centers in Ocean City is unavailable through secondary data collection.

3. *Other fishing related organizations*

The Marine Trades Association of Maryland is involved in providing information for boaters and fishermen in the state of Maryland. They hold safety classes and have a wide variety of information for boaters in their website. They represent marine issues in front of the state legislature, participate on governmental boards and committees related to boating and fishing, they also provide information and host boat shows in the area. The OC Reef Foundation is working to provide artificial reefs around Ocean City for the area's recreational fishermen (Oles 2003). A Coast Guard Auxiliary is located in Ocean City and holds safety classes as well as it's normal duties.

Physical

Ocean City is located about 30 minutes from the Salisbury-Wicomico County Regional Airport and has locally the Ocean City Municipal Airport for private flights (Worcester County 2008; OCCVB nd). It is accessible from Routes 50 and 90 from the west, and Delaware Route 1 from the north. Ocean City is located about 4.5 hours from New York City, about 3 hours from Washington D.C. and about 3 hours from Philadelphia, PA. A large park and ride facility has been established outside of Ocean City which allows visitors to park here and catch a bus into town (Oles 2003; OCCVB nd).

The commercial fishing industry in Ocean City is actually located in West Ocean City, an unincorporated segment of Worcester County just across the bay from Ocean City. The harbor here has a commercially-owned

350 Community Review comments, Dave Blazer, Executive Director, Maryland Coastal Bays, October 12, 2007
351 Community Review Comments, Kelly Clements Barnes, Administrative Assistant, Maryland Watermen's Association, September 13, 2007
352 Community Review comments, Dave Blazer, Executive Director, Maryland Coastal Bays, October 12, 2007

dock, a recreational fishing marina, and three commercial packing houses. Some private dock owners also lease space to the commercial vessels (Oles 2003). The Sunset Marina has a sheltered 18 acre deep water basin that can accommodate vessels up to 100 feet in length. There are 20 charter boats located here, as well as a bait and tackle shop and marine supplies shop. The Ocean City Fishing Center, also located in West Ocean City, has 170 slips, free parking and security. It is home to the largest charter fleet in the town, comprising 30 boats. It also has a bait shop, restaurant and repair service.

There are nine recreational marinas located in Ocean City and West Ocean City; 75% of the charter boats are found in three marinas, along with two of the largest ocean-going party boats. There are also a number of places along the shore frequented by anglers, including three pay piers (the Ocean Pier and the Oceanic Pier), the Route 50 Bridge, a number of public piers and bulkheads, and a public crabbing and fishing area on Isle of Wight. There are four public boat launches found in West Ocean City harbor. The Ocean City area also has a number of fish cleaning businesses (Oles 2003). The government of Ocean City owns the Bayside Boardwalk/ 9th St Fishing Pier and the Bering Road Boat Ramp (WCPC 2006).

Involvement in Northeast Fisheries[353]

Commercial

The commercial fishing industry in Ocean City is actually located in West Ocean City (McCay and Cieri 2000:89). However, the landings are declared for Ocean City and most vessels are listed as having their home port in Ocean City. The most valuable species in Ocean City in 2006 was scallops, followed by the surf clam and ocean quahogs. Overall, the landings values for 2006 were higher than the 10-year average values for the surf clam and ocean quahog category, and for scallops but were lower for the “other” category (see Table 1). Ocean City had approximately $5,000 and 10,000lbs of skate landings in 2007. There were only 2 skate dealers listed for 2007 in Ocean City.

The number of vessels listing Ocean City as their home port was highly variable from 1997 to 2006, ranging from a low of 17 in 1999 to a high of 47 in 2006. There were more boats listing Ocean City as their home port than there were vessels with owners residing in Ocean City, indicating that many people from outside Ocean City dock their boats there. Overall, the value of landings to home ported vessels showed a consistent increase for the years provided as did the level of fishing landed port (see Table 2). The level of home port fishing for Ocean City vessels was less in most years than the level of landings for Ocean City, pointing to the fact that many people from outside Ocean City are dropping off their catches in the town. Ocean City was one of nine ports with 50 or more Skate permits in 2007, as measured by listing or either homeport (50) or owner’s town of residence(6). These constituted 1.9% and 0.2%, respectively, of all 2007 skate permits.

Ocean City is a popular place for fishermen in the area to unload their catches because it is the only major ocean port between Cape May, NJ and Hampton Roads, VA. Even the people who are considered to be locals do not live in Ocean City itself but live about 30 minutes away on the land side of the harbor (McCay and Cieri 2000). Some of the fishermen who land their catch here are from Delaware, as there are no packing facilities in Delaware (Oles 2003).

In 2003 West Ocean City was home to five surf clam and ocean quahog boats, at least seven draggers, and at least fifteen small boats that engaged in potting, gillnetting, dredging, and/or handlining. Conching is a common practice among the smaller vessels. Twenty years ago, there were 30 surf clam and ocean quahog boats docked here, but consolidation resulting from the use of ITQs drastically reduced this number. Most of these are small, owner-

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353 In reviewing the commercial landings data several factors need to be kept in mind. 1) While both federal and state landings are included, some states provide more detailed data to NMFS than others. For example, shellfish may not be included or data may be reported only by county and not by port. 2) Some communities did not have individual port codes until more recently. Before individual port codes were assigned, landings from those ports were coded at the county level or as an aggregate of two geographically close small ports. Where landings were coded at the county level they cannot be sorted to individual ports for those earlier years, e.g., prior to 2000. 3) Where aggregated codes were used, those aggregate codes may still exist and be in use alongside the new individual codes. Here the landings which are still assigned to the aggregate port code cannot be sorted into the individual ports, so port level data are only those which used the individual port code. 4) Even when individual port codes exist, especially for small ports, landings may be coded at the county level. Here again it is impossible to disaggregate these to a port level, making the port level landings incomplete. 5) In all these cases, the per port data in this profile may under report the total level of landings to the port, though all landings are accounted for in the overall NMFS database.

operated vessels with the exception of four surf clam and ocean quahog boats owned by J.H. Miles Co., a clam harvesting and processing operation based in Norfolk, VA. There are three fish and shellfish packing facilities here, one of which is a satellite operation of J.H. Miles. Two of these fish houses opened recently, however one of these was a "re-opening" of an older fish house.354 Another fish house has existed there since 1957. The older packing house mostly buys from local boats, and has two draggers that land here. Some of the seafood here is sold at their retail market or to local restaurants, but most is sold to buyers in Hampton, VA, Philadelphia, or New York City (Oles 2003).

Landings by Species

Table 1. Dollar value of Federally Managed Groups of landings in Ocean City

	Rank Value of Average Landings from 1997-2006
Other355	1
Surf Clams, Ocean Quahog	2
Scallop	3
Summer Flounder, Scup, Black Sea Bass	4
Monkfish	5
Dogfish	6
Lobster	7
Squid, Mackerel, Butterfish	8
Bluefish	9
Skate	10
Smallmesh Groundfish356	11
Largemesh Groundfish357	12
Tilefish	13
Herring	14
Red Crab	15

(Note: Only rank value is provided because value information is confidential in ports with fewer than three vessels or fewer than three dealers, or where one dealer predominates in a particular species and would therefore be identifiable.)

Vessels by Year358

Table 24. Federal Vessel Permits Between 1997-2006

Year	**# Vessels (home ported)**	**# Vessels (owner's city)**
1997	28	18
1998	19	16
1999	17	14
2000	20	10
2001	25	9
2002	23	7

354 Community Review comments, Dave Blazer, Executive Director, Maryland Coastal Bays, October 12, 2007
355 "Other" species includes any species not accounted for in a federally managed group
356 Smallmesh Multi-Species: red hake, ocean pout, mixed hake, black whiting, silver hake (whiting)
357 Largemesh Groundfish: cod, winter flounder, yellowtail flounder, American plaice, sand-dab flounder, haddock, white hake, redfish, and pollock
358 Numbers of vessels by owner's city and homeport are as reported by the permit holder on permit application forms. These may not correspond to the port where a vessel lands or even spends the majority of its time when docked.

2003	27	9
2004	27	8
2005	40	12
2006	47	15

(Note: # Vessels home ported = No. of permitted vessels with location as homeport,
 # Vessels (owner's city) = No. of permitted vessels with location as owner residence359)

Recreational

Ocean City is famous for its recreational fishing and hosts many fishing tournaments every year. The most popular species to fish are bigeye and yellowfin tuna, mako and dolphin, white marlin, blue marlin and sailfish (OCCVB nd). Ocean City is known as the "White Marlin Capital of the World" (McCay and Cieri 2000). There are also many sportfishing associations such as the Ocean City Marlin Club and the Maryland Saltwater Sport Fishing Association. Ocean City has at least five large ocean-going party boats and around six party boats that fish in the bay. There are an estimated 100 charter boats in Ocean City's six major marinas. Tuna fishing is especially popular here; marlin tends to be a more elite fishery targeted by more expensive and exclusive charter boats. Ocean City is also popular with recreational anglers who fish from their own boats, from rental boats, or from shore; many of these are targeting summer flounder. There are numerous jetties, pay piers, and bridges from which anglers may fish, in addition to surf fishing from the beach. Crabbing and clamming are also important recreational activities. According to NMFS VTR data, between the years 2001-2005 there were a total of 31 charter and party boats which logged trips in Ocean City, carrying a total of 83,505 anglers on 3,137 different trips.

Subsistence

Fishing for something to take home for dinner is less common in Ocean City now than it once was, and catch-and-release fishing is increasingly popular (Oles 2003).

FUTURE

The Ocean City Development Corporation, appointed by the Mayor and Council, has many plans for the Downtown area of Ocean City. Current plans include more parking and mass transportation such as busses to help bring people to the downtown area. They are also planning on building a new wraparound boardwalk. A bayfront public park was completed in 2006.360 New zoning will help to bring in more businesses and improvement of the roadways and signs will make getting around much easier (OCPB 2007).

Some people who live in the Ocean City area have been worried about being priced out because the area is a resort destination, though recent drops in real estate prices may at least temporarily mitigate that (Latshaw 2007, 2008; Shane 2008).

Fishermen in the area are also concerned about rezoning in the harbor. One major concern is that the docks will become non-conforming meaning that replacement or fixing of the structures will be impeded. The fishermen are interpreting this rezoning to mean that people in the area are trying to force out the fishermen; much of the rezoning has been because of new condominiums being built in the area (McCay and Cieri 2000). Despite protective zoning measures, gentrification of the waterfront is a concern. Commercial fishing here does, however, serve as a tourist attraction and is important to the community in that respect (Oles 2003; OCPB 2007).

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359 The Owner-City from the permit files is technically the address at which the owner receives mail concerning their permitted vessels, which could reflect the actual location of residence, the mailing address as distinct from residence, owner business location, or the address at which a subsidiary receives mail about the permits.

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t. HAMPTON, VA[361]

Community Profile[362]

People and Places

15.1.12. Regional orientation

Hampton, Virginia (37.03°N, 76.35°W) was initially situated in Elizabeth City; they merged in 1952. Hampton is situated on the southern shores of the state near the entrance to the James River (City of Hampton nd). Hampton is located near the confluence of Hampton Bay and Virginia Roads the end of a peninsula, with access to both the Chesapeake Bay and the Atlantic Ocean (Google 2007). Hampton is part of the Hampton Roads area, which also includes Newport News, Virginia Beach, and Norfolk, as well as a number of other cities and towns whose inclusion varies by source.[363] Virginia Beach, Newport News, and Norfolk are all treated in separate community profiles.

ii.Historical/Background

Hampton is an independent city, in the Virginia Beach-Norfolk metro area. The community was named after the Earle of Southampton in the 17th century. Hampton and the surrounding area is the oldest continuous English-speaking settlement in America. Englishmen were sent by the Virginia Company of London in 1607 and established Jamestown; in 1610 a fortification was built in an area that would become Hampton to settle the area and the first Africans and women arrived in 1619 (City of Hampton nd). In the eighteenth century, Hampton became a thriving port, with tobacco as a chief export and medium of exchange. The wealth of the colonies around Hampton's waterfront made the Virginia Coast an inviting target for pirates in the 17th century. The most notorious of pirates was Blackbeard; after he was killed in a pitched battle his head was placed in at the entrance of the river (Blackbeard Festival nd). In the late 1800's, Union General Benjamin Butler first applied the term "contraband" to three runaway slaves, establishing an avenue to freedom for African Americans throughout the South (City of Hampton 2007). Hampton is also known for having the first battle between two ironclad ships in 1862, the Confederate *Merrimack* (aka *Virginia*) and the Union's *Monitor* (Department of the Navy nd).

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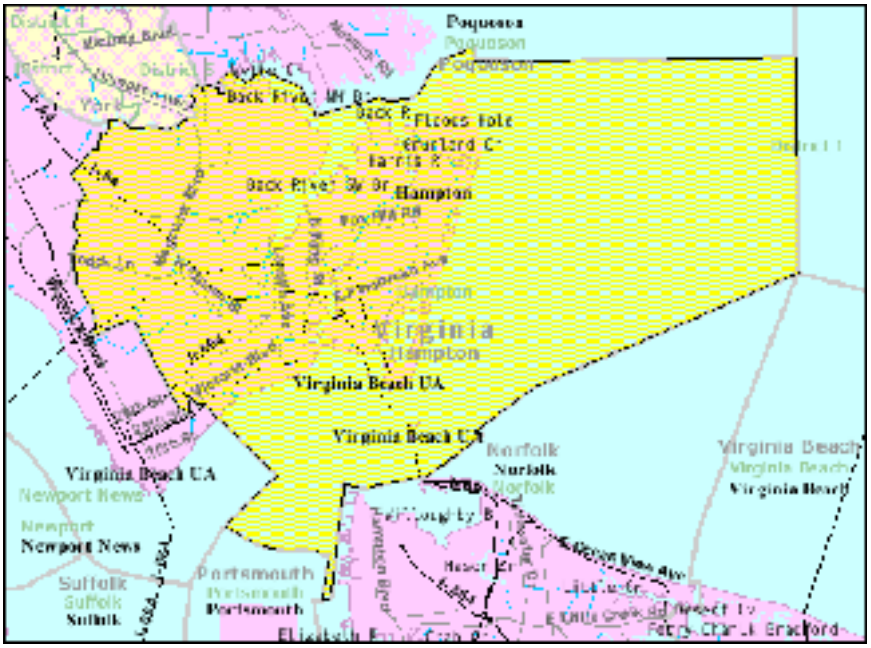
361 These community profiles have been created to serve as port descriptions in Environmental Impact Statements (EISs) for fisheries management actions. They also provide baseline information from which to begin research for Social Impact Assessments (SIAs). Further, they provide information relevant to general community impacts for National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and information on minorities and low income populations for Executive Order (E.O.) 12898 on Environmental Justice.
362 For purposes of citation please use the following template: "Community Profile of *Town, ST*. Prepared under the auspices of the National Marine Fisheries Service, Northeast Fisheries Science Center. For further information contact Lisa.L.Colburn@noaa.gov."
363 NOAA/NMFS in its Fisheries of the US defines Hampton Roads as Virginia Beach, Norfolk, Hampton, Newport News and Seaford (Liz Pritchard, Fisheries Statistics, Liz.Pritchard@noaa.gov). Hampton Roads Transit lists its destinations as Chesapeake, Hampton, Newport News, Norfolk, Portsmouth and Virginia Beach.



Map 1. Location of Hampton, VA (US Census Bureau 2000)

iii. **Demographics**[364]

According to Census 2000 data, the city had a population of 146,437, up 9.5% from a reported population of 133,793 in 1990. Of this 2000 total, 49.6% were males and 50.4% were females. The median age was 34.0 years and 70.1% of the population was 21 years or older while 12.5% of the population was 62 or older.

The population structure of Hampton (see Figure 1) showed a large population in both 0-19 and 20-49 year old age groups and a rapid drop off in the 50-59 year old age group, likely indicating large numbers of young families. The largest category was males in the 30-39 age category. The number of females exceeds the number of males in Hampton in the younger age categories, with the exception of the 10-19 age category.

364 While mid-term estimates are available for some larger communities, data from the 2000 Census are the only data universally available for the communities being profiled in the Northeast. Thus for cross-comparability we have used 2000 data even though these data may have changed significantly since 2000 for at least some communities.

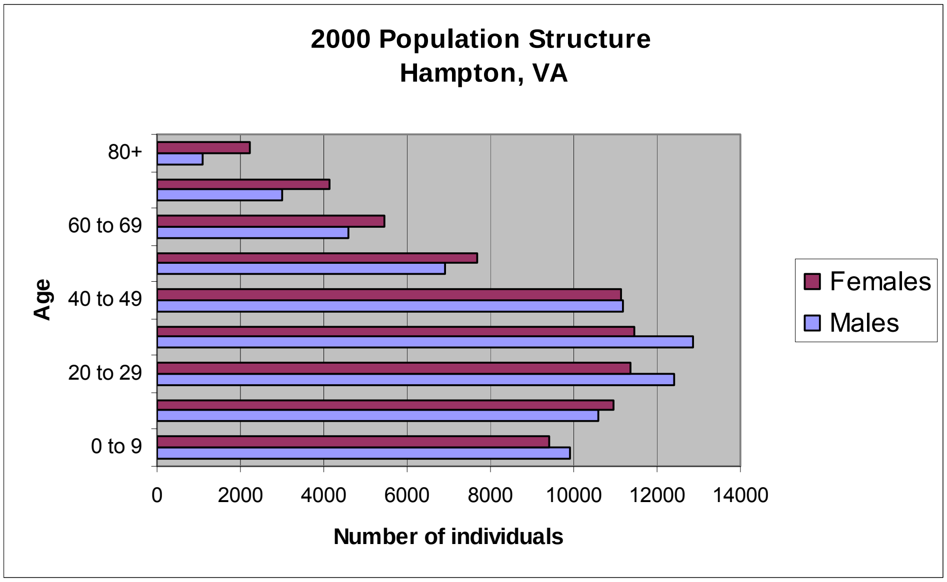


Figure 1. Hampton's population structure by sex in 2000 (US Census Bureau 2000)

The majority of the population was white (77.0%), with 12.6% of residents black or African American, 0.9% Native American, 3.7% Asian, and 0.1 % Pacific Islander or Hawaiian (see Figure 2). Only 2.8% of the total population identified themselves as Hispanic/Latino (see Figure 3). Residents linked their backgrounds to a number of different ancestries including: German (9.0%), English (7.8%), United States or American (7.2%), and Irish (7.1%). With regard to region of birth, 46.9% were born in Virginia, 46.8% were born in a different state, and 2.4% were born outside the U.S. (including 1.7% who were not United States citizens).

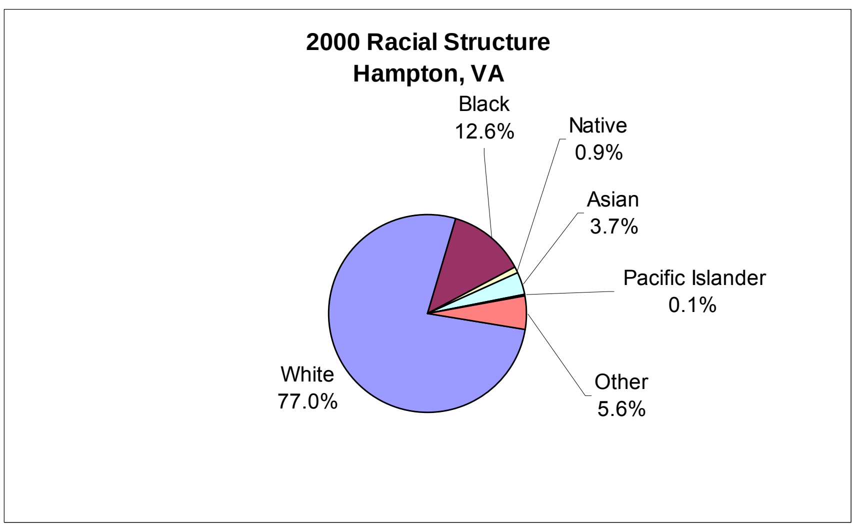


Figure 2. Racial Structure in 2000 (US Census Bureau 2000)

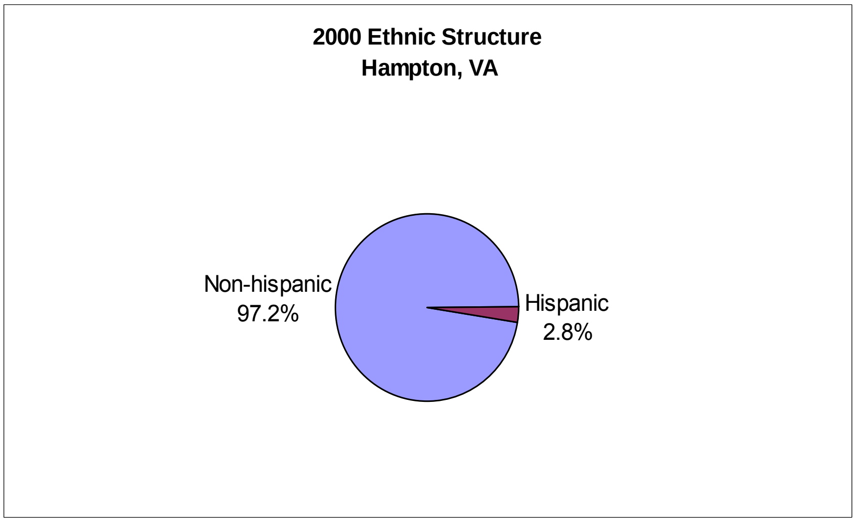


Figure 3. Ethnic Structure in 2000 (US Census Bureau 2000)

For 93.3% of the population, only English was spoken in the home, leaving 6.7% in homes where a language other than English was spoken, including 2.1% of the population who spoke English less than "very well" according to the 2000 Census.

Of the population 25 years and over, 85.5% were high school graduates or higher and 21.8% had a bachelor's degree or higher. Again of the population 25 years and over, 4.1% did not reach ninth grade, 10.4% attended some high school but did not graduate, 28.0% completed high school, 27.2% had some college with no degree, 8.6% received an associate's degree, 13.5% earned a bachelor's degree, and 8.3% received either a graduate or professional degree.

Although religion percentages are not available through the US Census, according to the Association of Religion Data Archives (ARDA) in 2000 the religion with the highest number of congregations and adherents in Hampton was Southern Baptist Convention with 21 congregations and 16,666 adherents. Other prominent congregations in the county were United Methodist (12 with 7,019 adherents), Catholic (5 with 5,217 adherents), and Assemblies of God (5 with 3,263 adherents). The total number of adherent to any religion was up 9.2% from 1990 (ARDA 2000).

iv. Issues/Processes

In August 2005, the coastal fisheries commission in VA approved capping the catch of menhaden in the Chesapeake Bay to about 230 million pounds. This most strongly affects Omega Protein Corp., the nation's largest menhaden processor, which has warehouse facilities in Norfolk. Menhaden fuels one of Virginia's largest commercial fishing industries and is considered an abundant resource coast-wide but biologists are concerned about the decline of young fish over the past 15 years (Latane 2005). Crew turnover on trawlers is also an emerging problem (McCay and Cieri 2000).

In June 2007, the Mid-Atlantic Fishery Management Council held a meeting in Hampton. Among various topics on the agenda were: research set-asides, fishing vessel safety, bycatch considerations, and quota levels for squid, mackerel, and butterfish (Mid-Atlantic Fishery Management Council 2007).

v. Cultural attributes

Hampton celebrates the famous Caribbean pirate Blackbeard, through the Hampton Blackbeard Festival every year in June. The event features Tall Ships, re-enactments of important battles and a Grand Pirate Ball. Also featured is the annual Hooked on Hampton Fishing Tournament (Blackbeard Festival nd).

The Hampton History Museum on Old Hampton Lane, boasts a wide selection of permanent and changing exhibits highlighting Hampton's rich history. Of maritime interest is the Port Hampton exhibit, where visitors can walk through a simulated ship's hold with original and reproduction artifacts, including old hogshead barrels to illustrate the importance of tobacco in Hampton's trade and commerce past (City of Hampton nd).

The Downtown Hampton In-Water Boat Show is held at the Hampton Public Piers water front and showcases boats in and out of the water from many regional boat dealers. The Seafest, a large marine trade show, is held every September (City of Hampton nd). Also in September, the town celebrates its waterfront heritage with art, entertainment and the regional seafood with the annual Hampton Bay Days festival.

Infrastructure

vi. Current Economy

The largest employers in Hampton are: Lucent Technologies, Gateway Computers (may not be here), Canon, tourism, Langley Air Force Base and NASA are, drawing mostly on highly skilled labor (McCay and Cieri 2000).

According to the U.S. Census 2000365, 62.4% (71,790 individuals) of the total population 16 years of age and over were in the labor force (see Figure 4), of which 3.7% were unemployed, 5.8% were in the Armed Forces, and 52.8% were employed.

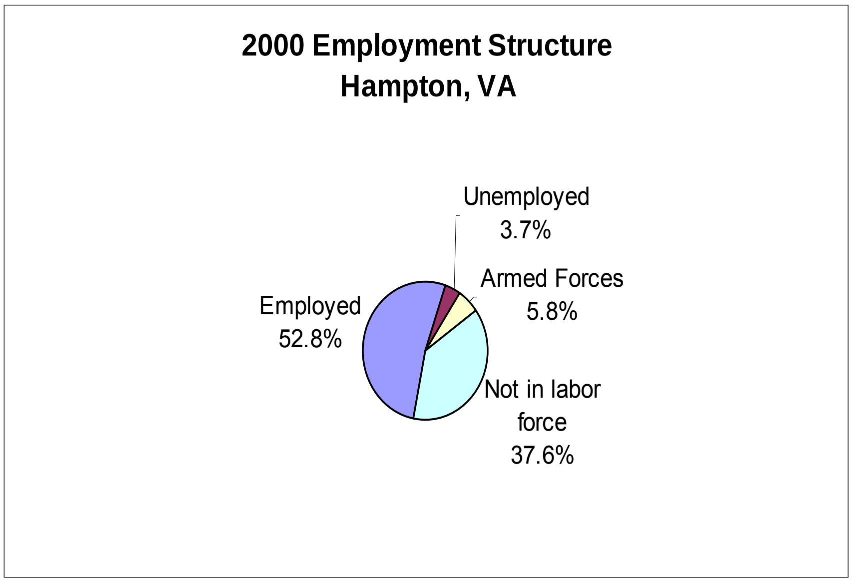


Figure 4. Employment structure in 2000 (US Census Bureau 2000)

According to the Census 2000 data, jobs in the census grouping which includes agriculture, forestry, fishing and hunting, and mining accounted for 208 positions or 0.3% of all jobs. Self employed workers, a category where fishermen might be found, accounted for 2,237 positions or 3.7% of jobs. Educational, health and social services (20.4%), manufacturing (15.5%) and retail trade (13.0%) were the primary industries.

Median household income in Hampton was $39,532 (up 15.3 % from $34,291 in 1990 [US Census Bureau 1990]) and per capita income was $19,774. For full-time year round workers, males made approximately 28.4% more per year than females.

The average family in Hampton in 2000 consisted of 3.02 persons. With respect to poverty, 8.8% of families (up from 2.5% in 1989 [US Census Bureau 1990]) and 11.3% of individuals earned below the official US Census poverty threshold. This threshold is $8,794 for individuals and ranges from $11,239-35,060 for families, depending on number of persons (2-9) (US Census Bureau 2000b). In 2000, 46.5% of all families of any size earned less than $35,000 per year.

In 2000, Hampton had a total of 57,311 housing units, of which 94.0% were occupied and 64.1 % were detached one unit homes. Less than ten percent (7.4%) of these homes were built before 1940. Mobile homes, boats and RV's accounted for 1.8% of the total housing units; 93.5% of detached units had between 2 and 9 rooms. In 2000, the median cost for a home in this area was $91,100. Of vacant housing units, 0.5% were used for seasonal, recreational, or occasional use. Of occupied units, 41.4% were renter occupied.

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365 Again, Census data from 2000 are used because they are universally available and offer cross-comparability among communities. Some statistics, particularly median home price, are likely to have changed significantly since 2000.

vii. Government

The Hampton City Council is composed of seven members, including an elected Mayor, and a Vice Mayor, who is selected by the Council after each election. Council members are elected to four-year terms in staggered elections in even years. The Council also appoints the City Manager, who is the chief administrator and executive officer of Hampton (City of Hampton nd).

viii. *Fishery involvement in government*

NOAA Fisheries, Fisheries Statistics Office, has three port agents based in Hampton. Port agents sample fish landings and provide a 'finger-on-the-pulse' of their respective fishing communities (NOAA Fisheries Service nd).

The Virginia Marine Resources Commission (VMRC) is a State Agency established in 1875 to preserve Virginia's marine and aquatic resources, including all tidal waters. The VMRC's Fisheries Management Division aids in the planning of state, interstate, and federal management organizations. Its Fisheries Advisory Council helps agencies create and implement management plans for both commercial and recreational fishery species. The Commission's headquarters are located in Newport News (VMRC nd).

ix. Institutional

Fishing associations

At the federal commercial level, there are no apparent active fishing associations in the Hampton Roads area. At the State level, there are several local "watermen's" associations, formed generally to address specific regulations being considered by the VMRC. These associations focus primarily on Chesapeake Bay fisheries.366 One such association (Working Waterman's Association) has its Vice President from Hampton (VMRC nd).

Fishery assistance centers

Information on fishery assistance centers in Hampton is unavailable through secondary data collection.

Other fishing related institutions

The Coastal Conservation Association (CCA) operates a state chapter out of Virginia Beach, VA with activities in Hampton. The CCA is a non-profit organization aiming to education the public about marine conservation. The CCA's members are primarily saltwater anglers (Coastal Conservation Association nd).

15.1.13. Physical

Hampton is located south of Interstate Highway 64 along the Hampton River. Hampton is located approximately 30 miles from Virginia Beach, 30 miles from Historic Williamsburg, 17 miles from Norfolk and 7 miles from Newport News. Hampton is 3 miles from Langley Air Force Base, 11 miles from Newport News/Williamsburg International Airport, and approximately 14 miles from Norfolk International Airport. There are Amtrak stations in both Newport News (7 miles) and Norfolk (14 miles) (Google nd). The Hampton Roads Transit (HRT) provides public transportation service throughout the Hampton Roads area.

Hampton's extensive waterfront offer access to multiple marinas (City of Hampton, Virginia, Hampton Marinas nd.), including the Salt Ponds Marina Resort which is one of the largest on the Chesapeake Bay, providing storage for boats up to 80 feet long and a wide range of marina services. The Intercoastal Waterway also flows through Hampton, accommodating various types of boat traffic (City of Hampton nd). Hampton Marine Services offers parts and services for different vessel types and has been in business for over 20 years. On the west side of the Hampton River near downtown is a large working wharf with numerous yachting centers (Downtown Hampton Development Partnership nd).

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366 Personal Communication, David Ulmer, NOAA Port Agent, P.O. Box 69043, Hampton, VA 23669, (David.Ulmer@noaa.gov), July 21, 2006

Involvement in Northeast Fisheries367

15.1.14. Commercial

The top three species landed in Hampton (see Table 1) by value were sea scallops, "other," and summer flounder, scup, and black sea bass. Sea scallops values far exceeded any other species landings in Hampton. Blue crab is a state managed species, so landings values are not shown in Table 1 but may be significant in Hampton. In addition, menhaden is one of Virginia's largest commercial fisheries, with 58% of the total coast-wide harvest from 1996 to 2004 coming from the Chesapeake Bay. In 2004, commercial menhaden landings generated about $24 million for the Virginia economy and about 395 full time jobs (Southwick Associates Inc. 2006).

Sea-scalloping with dredges is the most important fishery by value, although a significant portion of scallops are caught out of Hampton using otter trawl vessels. The landing value of scallops in 2006 was more than double the 1997-2006 scallop landings average.

The diversity of species landed in Hampton is high, as is the types of gear used. These gear types include: handlines, haul seines, pound nets, sink gillnets, pots, patent tong for hard clams, as well as the popular scallop dredge and otter trawls. There is also a small amount of pelagic longlining occurring from Hampton, targeting various sharks and tuna. In 1999, two or three boats in Hampton had Vietnamese owners, captains and crew. Crab picking and oyster shucking, once important trades, are now supported by only one crab house (McCay and Cieri 2000). No skate dealers are listed in Hampton in 207; Amory's Seafood used to buy skate from the monkfish gillnet fleet, but the vessels are no longer brining skate in and they no longer buy368. In general, what were already low levels of skate landings have dropped in recent years (NEFMC 2008: 8-338).

The number of vessels home ported and the number of vessels whose owner lives in Hampton (see Table 2) has stayed relatively consistent from 1997 to 2003, after which there is a decline in vessels through 2006. Less than one percent of 2007 skate permits list Hampton as either homeport (0.56%) or owner's town of residence (0.53%).

Landings by Species

Table 1. Rank Value of Landings for Federally Managed Groups

Species	Rank Value of Average Landings from 1997-2006
Scallop	1
Other369	2
Summer Flounder, Scup, Black Sea Bass	3
Squid, Mackerel, Butterfish	4
Monkfish	5
Bluefish	6
Herring	7
Lobster	8

367 In reviewing the commercial landings data several factors need to be kept in mind. 1) While both federal and state landings are included, some states provide more detailed data to NMFS than others. For example, shellfish may not be included or data may be reported only by county and not by port. 2) Some communities did not have individual port codes until more recently. Before individual port codes were assigned, landings from those ports were coded at the county level or as an aggregate of two geographically close small ports. Where landings were coded at the county level they cannot be sorted to individual ports for those earlier years, e.g., prior to 2000. 3) Where aggregated codes were used, those aggregate codes may still exist and be in use alongside the new individual codes. Here the landings which are still assigned to the aggregate port code cannot be sorted into the individual ports, so port level data are only those which used the individual port code. 4) Even when individual port codes exist, especially for small ports, landings may be coded at the county level. Here again it is impossible to disaggregate these to a port level, making the port level landings incomplete. 5) In all these cases, the per port data in this profile may under report the total level of landings to the port, though all landings are accounted for in the overall NMFS database.

368 Pers. com. Mead Amory, owner Amory's Seafood in Hampton, VA, November 5, 2008.

369 "Other" species includes any species not accounted for in a federally managed group

Largemesh Groundfish370	9
Dogfish	10
Skate	11
Smallmesh Groundfish371	12
Tilefish	13

(Note: Only rank value is provided because value information is confidential in ports with fewer than three vessels or fewer than three dealers, or where one dealer predominates in a particular species and would therefore be identifiable.)

Vessels by Year**372**

Table 2. Federal Vessel Permits Between 1997-2006

Year	# Vessels (home ported)	# Vessels (owner's city)
1997	14	30
1998	11	30
1999	11	30
2000	11	31
2001	10	29
2002	11	35
2003	7	27
2004	8	29
2005	6	31
2006	10	22

(Note: # Vessels home ported = No. of permitted vessels with location as homeport,
 # Vessels (owner's city) = No. of permitted vessels with location as owner residence373)

Recreational

In 2005, the economic impact generated by marine recreational fishing in Hampton was third highest in the state, next to Virginia Beach and Newport News. The total sales/economic activity for Hampton was $53,275,000, a cumulative income of $30,639,000, and recreational fishing employed 757 people. In 2004, 20 % more marine recreational licenses were sold than in 1994 (Southwick Associates Inc. 2006). There are numerous sport fishing operations and dealers in Hampton. Most businesses offer sight seeing tours on the water in addition to chartered fishing trips. Vessels fish mostly in the Lower Chesapeake Bay and Hampton Roads, usually targeting bottom fish such as croaker, trout, bluefish, and flounder (Hampton Roads Charters Inc. nd).

Subsistence

Information on subsistence fishing in Hampton is either unavailable through secondary data collection or the practice does not exist.

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370 Largemesh groundfish: cod, winter flounder, yellowtail flounder, American plaice, sand-dab flounder, haddock, white hake, redfish, and pollock
371 Smallmesh multi-species: red hake, ocean pout, mixed hake, black whiting, silver hake (whiting)
372 Numbers of vessels by owner's city and homeport are as reported by the permit holder on permit application forms. These may not correspond to the port where a vessel lands or even spends the majority of its time when docked.
373 The Owner-City from the permit files is technically the address at which the owner receives mail concerning their permitted vessels, which could reflect the actual location of residence, the mailing address as distinct from residence, owner business location, or the address at which a subsidiary receives mail about the permits.

FUTURE

There is pressure by developers to use dock space for tourist-related infrastructure (McCay and Cieri 2000). Also, during the 2003-2005 in the Hampton Roads area at least fifteen scallop vessels were sold to a New England processing company. Some fishermen see a trend where a few large companies are purchasing vessels, thus, creating a monopoly in the scallop industry. Concerns also exist that big business will squeeze small vessels out of the industry.374

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374 Personal communication, NOAA port agent George Mattingly, 1006N Settlers Landing Road, P.O. Box 69043, Hampton, VA 23669, 978 609-4150, May 12, 2006

16. Document 16

Re-Estimated Rebuilding Prospects Using New Assessment Data

New England Fishery Management Council
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John Pappalardo, *Chairman* | Paul J. Howard, *Executive Director*

MEMORANDUM

DATE: **January 14, 2008**

TO: Science and Statistical Committee

FROM: Skate PDT

SUBJECT: **Skate rebuilding catch limit re-analysis**

This analysis incorporates the new Data Poor Assessment Workshop[375] skate catch time series into the previous PDT evaluation of skate rebuilding potential. While total landings were updated and new methods to allocate unclassified skate landings to species were developed in the DPWS, new discard estimates were completely revised using observer data which had not previously been included. As a result, the re-assignment of catches to skate species were revised and total discard estimates are substantially different than previous data used in the Draft Amendment 3 analysis.

Like the previous assessment, the new analyses evaluate the relationship between catch, relative exploitation (catch/biomass) and changes in stratified mean biomass estimated by the surveys (spring for little skate, fall for the remaining six species). To smooth out noise from annual indices, a 3-year moving average for catch and biomass with no lags was evaluated[376]. Based on this type of analysis, the PDT recommended and the SSC approved using the median relative exploitation ratio (C/B) applied to the latest three year stratified mean biomass as an interim catch limit to initiate rebuilding of smooth, thorny, and winter skates.

The median values (2005-2007) for each species were summed and applied as an aggregate skate ABC/ACT, accounting for the partial effectiveness (assumed 90%) of barndoor, smooth, and thorny skate landings prohibitions. A value of 75% of the threshold catch limit was recommended to account for scientific and management uncertainty, approved for a management target, and applied as an ACT in the Draft Amendment 3 document. The average discard rate for 2004-2006 and two different historic landings splits between the skate wing and bait fisheries was then applied to estimate TALs for each fishery. The same procedure was applied in this analysis, except that the 2005-2007 discard rate was

[375] A Data Poor Assessment Workshop (DPWS) was conducted by the Northeast Fisheries Science Center during October 2008 to January 2009, focusing on exploratory assessment analyses of model-resistant species, including the seven managed skate stocks. While the survey time series is believed to be a good representation of changes in skate abundance and biomass, there has been considerable uncertainty in the skate species landings and in discard estimates. One of the important outcomes of the DPWS was two methods to allocate skate catches to species based on where the fishing activity occurred and the observed lengths of skate catches.
[376] Other lags and moving average durations were evaluated in the Draft Amendment 3 technical analyses and were not informative, i.e. correlations between catch or relative exploitation and biomass changes were worse.

applied, now that 2007 discard estimates have been calculated in the DPWS. A summary of comparative results are given in the table below.

Data source	Catch limit, mt (ABC/ACL)	Catch target, mt (ACT)	Discard rate	Total allowable landings, mt (TAL)	MSY (landings with biomass @ target)	Landings reduction from 2007 to achieve TAL	
						Wing	Bait
Draft Amendment 3	22,612	16,959	38%	10,484	53,731	-45%	-43%
DPWS Length composition method.	24,688	15,546	58%	7,786	64,196	-57%	-63%
DPWS selectivity ogive method	23,826	17,864	59%	7,328	63,240	-65%	-60%

Although they were initially different and derived independently, the two DPWS method catch series have become similar with refinement. As indicated above, there really is little difference between them in the context of the Amendment 3 rebuilding prospects at catch rates below and above the median values for the time series. Even the overall catch limit (landings and discards) are similar to the Draft Amendment 3 results, but the higher discard estimates result in a lower fraction (41-42%) of the total catch being allocated to landings (i.e. TAL).

Analysis of rebuilding potential, however, shows that the linkage between low exploitation rates and increases in biomass is either non-existent or not significant. None of the relationships are very strong and are probably not very predictive of rebuilding potential at lower catch levels. There is little or no relationship between the C/B ratio and changes in biomass for barndoor, clearnose, little, or thorny skates. The relationship for smooth and rosette seem entirely attributable to a few number of points which may be related to transient oceanographic events or sampling variability, while the relationship for winter seems to be related to serial autocorrelation.

Catch time series

For the Amendment 3 DEIS, the PDT estimated landings species composition by applying the survey biomass proportions for exploitable skates in each three-digit statistical area, as determined by a fitted logistic selectivity curve (fitting observed commercial kept skates to the survey in equivalent areas and seasons) of observed kept skate lengths on survey length frequencies in each region and season. Although known at the time, this procedure had a technical flaw and inconsistency with the survey design, but was not thought to significantly skew the species allocations. During the DEIS comment period, NMFS commented on this flaw in the analysis and it would be addressed in the DPWS[377]. Although the Council was slated to take final action at the November 2008 meeting, NMFS recommended that the Council wait to receive these results to determine whether to proceed with Amendment 3.

[377] Analyses were presented at the DPWS that the previous Amendment 3 assumption did not badly violate the survey statistical design and did not skew the biomass proportions or the calculated mean biomass of each species in a statistical area.

During the Amendment 3 development, the PDT also only had regional estimates (Georges Bank/Southern New England and Mid-Atlantic) of aggregate skate discards to use in the Amendment 3 analyses. These discard estimates used SAW44-reviewed procedures, but used the Groundfish Assessment Review Meeting (GARM) area allocation tables[378] to assign landings to statistical area and region. Because species composition of discards was not available at the time, the PDT used the regional skate discard estimates as a catch index for species by region (Georges Bank/Southern New England for thorny, smooth, winter, and little skates; Mid-Atlantic for clearnose and rosette skates).

The new catch series for this analysis allocate skate landings and discards to species based on surveyed biomass fractions using two different methods. These two methods were developed simultaneously, and independently arrived at similar results to one another. The details are described in the DPWS documents, but are summarized below. Each method has its pros and cons and both methods were accepted by the DPWS.

For the length composition method, the skate lengths of kept and discarded skates were binned into 5 cm intervals and applied to the survey biomass fractions by region. These biomass fractions were applied to total landings and total discard estimates by year, half-year, gear, and region (Gulf of Maine, Southern New England, and Mid-Atlantic). Discard to kept ratios were applied to total landings on all trips, also by year, half-year, gear, and region. The discard species composition was calculated in the same fashion as that for landings, using the length composition of discarded skates on observed trips. For both landings and discards, the species composition could only be determined since 1989, the first year of sea sampling data. Total discards were however hind-casted by applying the 1989-1991 DK ratio to dealer reported landings in earlier years.

For the selectivity ogive method of assigning species composition to skate landings and discards, the fraction of skate biomass for skate species were determined by estimating a selectivity ogive from kept skates on observed trips during 2004-2006 applied to surveyed skates in each three digit statistical area by year, gear, and season (spring, fall, and winter corresponding to the three trawl surveys). The survey biomass fractions were determined by applying the 2004-2006 selectivity ogive by year, season, sub-region, gear, and mesh (small, large, and extra-large for trawls and gillnets). Subsequent to the DPWS, these fractions were re-estimated by treating the fractions kept for vessels using gillnets separately for the skate wing and whole/bait fisheries[379]. This is the same procedure as the DPWS approved for trawls and recommended that it be used for the gillnet fishery as well.

Total discards were independently estimated for the DPWS by estimating the DK ratios[380] for each year, gear, sub-region, season, and mesh and applying them to total landings on every trip reported by dealers and included in the GARM area allocation tables. Trips in these tables with unknown area allocations were distributed to areas, based on fishing activity for assigned trips in each state, year, and gear combination. Skate species allocations were made using the same procedure that the DPWS accepted for landings, using the selectivity ogive method, except that for trips landing skates the species composition of discards were determined by A – B, where A is the selectivity ogive fitted for catch and B is the selectivity ogive fitted for kept skates. For trips with no skate landings in the dealer data, only the

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[378] These area allocation tables use a peer-reviewed method to allocate dealer reported landings to statistical area level fishing locations.
[379] The DPWS estimates use a single selectivity ogive for all skate landings by vessels using gillnets and it was discovered during the review that a substantial fraction of gillnet landings are landed in whole form, presumably targeting little skates for bait.
[380] Skates discarded to total live weight of landings of all species on observed trips, which are then applied to total live weight of dealer reported landings of all species.

selectivity ogive for catch (A) was used to assign species composition to skate discards. Since the method uses the length distribution of skates in the survey to determine species composition, the species allocations could be assigned as far back as 1977.

This analysis of rebuilding potential described below uses the species composition of 1994-2007 landings and discards from each species allocation method independently to examine the effect of catch on changes in survey skate biomass. For 1977-1993, the total skate landings and both discard estimates were assigned the species composition determined by the selectivity ogive method (because there were no observed trips before 1989 and no GARM area allocation tables before 1994). Before the advent of the sea sampling program in 1989, both methods apply the 1989-1991 DK ratio to total landings. The data used in this analysis are shown in the following tables.

Table 25. Landings time series used in the rebuilding potential analysis and in estimating catch limits and targets associated with the median C/B exploitation ratio. Landings before 1994 were derived from the same time series of aggregate landings and species composition was assigned via the selectivity ogive method.

Length composition method
Landings Allocations

Year	barndoor	clearnose	little	rosette	smooth	thorny	winter
1964	4.62	0.00	1.14	0.03	0.29	20.05	4.57
1965	5.78	0.00	1.87	0.02	0.44	25.03	5.46
1966	3.41	0.00	1.26	0.00	0.20	21.49	4.54
1967	3.68	1.23	5.48	0.12	0.56	42.38	18.24
1968	2.62	1.55	2.45	0.00	0.40	20.84	7.83
1969	2.62	1.30	3.54	0.01	0.48	32.43	11.21
1970	1.95	0.47	4.79	0.03	0.52	46.86	14.97
1971	0.78	0.64	5.24	0.05	0.90	37.77	17.92
1972	1.61	0.00	6.05	0.00	0.74	51.57	25.93
1973	1.43	0.71	6.82	0.03	0.77	47.47	29.67
1974	1.19	0.75	6.42	0.03	0.66	40.68	30.37
1975	1.51	1.20	9.34	0.04	0.87	53.56	47.58
1976	1.30	1.31	9.37	0.04	0.79	48.36	51.03
1977	1.47	1.91	12.64	0.05	0.96	58.22	73.05
1978	2.51	4.26	26.30	0.10	1.78	107.16	160.49
1979	3.27	7.52	43.61	0.15	2.60	155.39	279.66
1980	3.08	10.14	55.63	0.19	2.89	170.84	373.34
1981	1.10	5.80	30.21	0.09	1.34	78.44	211.42
1982	0.02	8.68	50.86	0.21	1.14	88.77	279.02
1983	0.00	11.38	76.64	0.01	3.42	124.33	666.91
1984	0.28	22.71	69.73	0.28	1.59	114.00	622.20
1985	0.06	12.71	51.44	0.08	2.32	72.72	623.98
1986	0.36	13.84	30.73	0.10	4.26	78.53	858.28
1987	0.32	40.34	84.38	0.26	4.52	107.37	1202.52
1988	0.01	63.95	99.07	0.51	10.73	163.98	1775.47
1989	1.03	112.20	550.87	0.70	27.51	692.92	5322.07
1990	14.39	322.67	830.97	1.07	65.07	859.75	9308.58
1991	16.47	983.65	1332.93	3.82	51.05	1173.66	7770.72
1992	471.60	746.18	1379.39	4.11	77.86	2089.16	7757.00
1993	70.90	1054.90	2915.57	2.20	117.38	1581.75	7161.30
1994	134.20	973.71	1794.69	6.62	89.09	1966.44	3818.55
1995	83.11	348.48	1926.66	5.39	0.77	314.57	4453.48
1996	336.39	539.89	2399.89	11.01	0.37	759.51	10051.54
1997	281.04	748.73	3792.04	12.90	6.99	510.38	5353.70
1998	161.12	447.45	4028.73	27.33	7.83	628.19	8344.25
1999	452.37	324.36	3680.41	15.35	2.09	203.71	6866.57
2000	494.42	501.95	3336.02	19.96	7.67	466.39	8372.99
2001	1536.85	1860.07	1700.99	8.61	18.78	195.42	7655.28
2002	2123.66	640.20	2371.81	10.72	17.24	401.63	7094.18
2003	854.82	335.61	3302.87	5.82	8.55	302.94	9986.12
2004	844.52	344.54	1955.26	6.80	5.63	511.56	11787.82
2005	1976.34	168.47	3056.36	8.97	10.39	439.86	7650.58
2006	2632.83	384.49	2392.33	8.63	21.51	642.97	9256.81
2007	2011.46	361.73	3078.31	22.41	17.84	351.91	12860.80
1995-2007 proportions	7.9%	4.0%	21.3%	0.1%	0.1%	3.3%	63.2%

Selectivity ogive method
Landings Allocations

Year	barndoor	clearnose	little	rosette	smooth	thorny	winter
1964	4.62	0.00	1.14	0.03	0.29	20.05	4.57
1965	5.78	0.00	1.87	0.02	0.44	25.03	5.46
1966	3.41	0.00	1.26	0.00	0.20	21.49	4.54
1967	3.68	1.23	5.48	0.12	0.56	42.38	18.24
1968	2.62	1.55	2.45	0.00	0.40	20.84	7.83
1969	2.62	1.30	3.54	0.01	0.48	32.43	11.21
1970	1.95	0.47	4.79	0.03	0.52	46.86	14.97
1971	0.78	0.64	5.24	0.05	0.90	37.77	17.92
1972	1.61	0.00	6.05	0.00	0.74	51.57	25.93
1973	1.43	0.71	6.82	0.03	0.77	47.47	29.67
1974	1.19	0.75	6.42	0.03	0.66	40.68	30.37
1975	1.51	1.20	9.34	0.04	0.87	53.56	47.58
1976	1.30	1.31	9.37	0.04	0.79	48.36	51.03
1977	1.47	1.91	12.64	0.05	0.96	58.22	73.05
1978	2.51	4.26	26.30	0.10	1.78	107.16	160.49
1979	3.27	7.52	43.61	0.15	2.60	155.39	279.66
1980	3.08	10.14	55.63	0.19	2.89	170.84	373.34
1981	1.10	5.80	30.21	0.09	1.34	78.44	211.42
1982	0.02	8.68	50.86	0.21	1.14	88.77	279.02
1983	0.00	11.38	76.64	0.01	3.42	124.33	666.91
1984	0.28	22.71	69.73	0.28	1.59	114.00	622.20
1985	0.06	12.71	51.44	0.08	2.32	72.72	623.98
1986	0.36	13.84	30.73	0.10	4.26	78.53	858.28
1987	0.32	40.34	84.38	0.26	4.52	107.37	1202.52
1988	0.01	63.95	99.07	0.51	10.73	163.98	1775.47
1989	1.03	112.20	550.87	0.70	27.51	692.92	5322.07
1990	14.39	322.67	830.97	1.07	65.07	859.75	9308.58
1991	16.47	983.65	1332.93	3.82	51.05	1173.66	7770.72
1992	471.60	746.18	1379.39	4.11	77.86	2089.16	7757.00
1993	70.90	1054.90	2915.57	2.20	117.38	1581.75	7161.30
1994	112.38	10.09	717.39	0.00	29.39	2145.64	5309.57
1995	51.43	31.91	2109.72	0.80	27.59	1159.32	3051.41
1996	199.71	79.48	2436.66	0.18	71.95	1234.55	9877.93
1997	181.84	239.29	3748.39	0.12	68.67	1014.86	5195.41
1998	343.60	63.56	3084.12	0.27	67.25	2264.86	7233.26
1999	443.87	132.34	3482.30	0.93	67.71	888.61	6327.13
2000	514.35	268.18	3472.49	4.77	73.93	1847.52	6659.84
2001	540.10	193.70	2826.88	5.31	52.79	856.79	8184.23
2002	366.24	114.21	2663.35	1.00	60.25	1239.88	8521.89
2003	163.09	168.07	4685.24	1.50	18.09	298.09	10082.51
2004	111.30	51.86	2950.85	0.04	4.11	62.78	11017.90
2005	231.26	47.84	3277.84	0.12	28.78	63.84	8869.66
2006	668.31	55.51	3581.54	2.62	44.68	129.68	10571.61
2007	89.11	98.34	4019.34	2.96	8.03	207.92	13510.25
	2.3%	0.9%	25.1%	0.0%	0.4%	6.7%	64.6%

Draft Amendment 3
Landings Allocations

Year	barndoor	clearnose	little	rosette	smooth	thorny	winter
1964							
1965							
1966							
1967							
1968							
1969							
1970							
1971							
1972							
1973							
1974							
1975							
1976							
1977							
1978							
1979							
1980							
1981							
1982							
1983	7	4	397	0	1	60	387
1984	6	4	365	0	1	38	356
1985	8	5	472	0	1	28	459
1986	12	8	689	0	2	49	671
1987	17	11	1,011	0	3	34	985
1988	55	36	3,209	1	8	30	3,124
1989	94	61	5,456	2	14	15	5,311
1990	93	61	5,423	2	14	8	5,278
1991	103	67	5,993	2	15	14	5,834
1992	106	69	6,174	2	16	45	6,009
1993	72	47	4,200	1	11	124	4,088
1994	16.77	11.14	2670.78	0.24	14.20	125.25	4872.74
1995	20.77	26.26	3111.49	2.07	7.69	59.64	3278.95
1996	89.53	26.37	5992.46	1.38	23.97	37.76	7516.65
1997	175.97	153.33	6792.83	2.78	8.30	58.24	3635.79
1998	149.14	77.06	7706.28	1.37	13.45	121.04	6269.40
1999	154.25	89.01	6332.24	6.17	18.91	43.05	4622.77
2000	290.19	193.24	6984.79	1.95	9.16	39.53	5101.72
2001	336.13	91.00	6416.26	7.49	6.89	31.86	5767.17
2002	307.36	65.26	5704.98	1.59	9.87	27.33	6788.21
2003	52.19	30.63	6810.86	6.53	20.86	46.06	7892.06
2004	62.84	43.56	5422.44	2.91	6.27	23.77	9548.52
2005	63.69	54.31	6144.09	5.12	11.11	17.78	6948.28
2006	131.05	90.12	6854.99	9.72	28.64	24.22	8815.75
2007	152.35	104.76	7968.89	11.30	33.29	67.40	10248.26
	1.2%	0.6%	47.7%	0.0%	0.1%	0.3%	50.1%

Table 26. Discard time series used in the rebuilding potential analysis and in estimating catch limits and targets associated with the median C/B exploitation ratio. Discards before 1993 were derived from the same source using DK ratios from the DPWS and the species composition using the selectivity ogive method.

Length composition method
Discards Allocations

Year	Barndoor	Clearnose	Little	Rosette	Smooth	Thorny	Winter
1964	13,820	-	9,422	169	1,551	61,225	17,508
1965	14,611	-	12,760	270	2,074	65,717	16,393
1966	10,627	-	11,229	-	1,113	70,109	16,502
1967	4,146	2,302	16,699	1,100	1,003	48,940	23,819
1968	5,752	3,702	16,402	80	1,525	49,761	19,941
1969	3,654	2,127	14,621	113	1,186	49,507	17,934
1970	1,704	720	11,916	129	816	44,796	14,752
1971	708	526	12,497	45	1,157	30,091	15,233
1972	845	-	9,328	-	732	29,592	16,374
1973	825	498	11,256	53	751	28,273	18,196
1974	739	555	11,467	53	698	26,139	19,910
1975	559	522	9,979	45	552	20,530	18,464
1976	529	619	11,031	48	551	20,357	21,615
1977	536	794	13,315	57	597	21,869	27,478
1978	553	1,062	16,834	71	673	24,380	36,423
1979	489	1,259	18,960	78	669	23,929	42,838
1980	375	1,372	19,726	80	607	21,374	46,381
1981	252	1,467	20,196	80	534	18,421	49,266
1982	6	1,914	27,399	151	365	17,074	52,965
1983	-	1,175	22,731	4	622	12,738	64,438
1984	27	2,400	20,160	124	259	11,205	63,077
1985	6	1,304	13,956	33	343	7,026	56,648
1986	32	1,231	7,755	37	540	6,826	65,596
1987	25	2,459	15,778	61	412	6,454	64,335
1988	2	2,841	11,538	118	732	6,856	67,492
1989	15	1,559	22,280	59	550	8,852	61,967
1990	129	3,595	26,349	47	1,016	9,050	85,647
1991	104	6,033	27,316	119	536	7,561	47,670
1992	1,766	3,371	18,290	90	577	9,299	34,270
1993	178	3,023	24,196	23	546	4,371	21,616
1994	871	6,956	40,319	204	1,037	14,161	31,239
1995	349	4,006	32,697	223	565	745	27,574
1996	108	5,315	33,937	407	350	482	21,953
1997	353	761	19,277	69	491	568	11,205
1998	265	3,218	34,173	218	755	1,134	25,728
1999	221	776	17,262	101	291	440	12,056
2000	1,392	1,581	18,272	176	342	582	13,392
2001	1,907	1,202	16,424	145	684	923	16,962
2002	2,398	1,411	17,266	77	582	852	17,523
2003	1,484	1,196	28,756	38	1,207	1,178	20,041
2004	1,450	1,521	17,493	48	1,590	721	24,138
2005	4,247	1,325	20,101	90	1,839	761	18,922
2006	4,254	738	13,486	46	1,126	595	15,890
2007	4,065	2,002	19,014	43	866	444	21,023
1995-2007 proportions	3.7%	4.1%	47.7%	0.3%	1.8%	1.6%	40.8%

Selectivity ogive method
Discards Allocations

Year	Barndoor	Clearnose	Little	Rosette	Smooth	Thorny	Winter
1964	13,820	-	9,422	169	1,551	61,225	17,508
1965	14,611	-	12,760	270	2,074	65,717	16,393
1966	10,627	-	11,229	-	1,113	70,109	16,502
1967	4,146	2,302	16,699	1,100	1,003	48,940	23,819
1968	5,752	3,702	16,402	80	1,525	49,761	19,941
1969	3,654	2,127	14,621	113	1,186	49,507	17,934
1970	1,704	720	11,916	129	816	44,796	14,752
1971	708	526	12,497	45	1,157	30,091	15,233
1972	845	-	9,328	-	732	29,592	16,374
1973	825	498	11,256	53	751	28,273	18,196
1974	739	555	11,467	53	698	26,139	19,910
1975	559	522	9,979	45	552	20,530	18,464
1976	529	619	11,031	48	551	20,357	21,615
1977	536	794	13,315	57	597	21,869	27,478
1978	553	1,062	16,834	71	673	24,380	36,423
1979	489	1,259	18,960	78	669	23,929	42,838
1980	375	1,372	19,726	80	607	21,374	46,381
1981	252	1,467	20,196	80	534	18,421	49,266
1982	6	1,914	27,399	151	365	17,074	52,965
1983	-	1,175	22,731	4	622	12,738	64,438
1984	27	2,400	20,160	124	259	11,205	63,077
1985	6	1,304	13,956	33	343	7,026	56,648
1986	32	1,231	7,755	37	540	6,826	65,596
1987	25	2,459	15,778	61	412	6,454	64,335
1988	2	2,841	11,538	118	732	6,856	67,492
1989	15	1,559	22,280	59	550	8,852	61,967
1990	129	3,595	26,349	47	1,016	9,050	85,647
1991	104	6,033	27,316	119	536	7,561	47,670
1992	1,766	3,371	18,290	90	577	9,299	34,270
1993	178	3,023	24,196	23	546	4,371	21,616
1994	374	13,349	52,307	715	543	5,121	22,379
1995	149	5,927	36,530	495	285	1,375	21,398
1996	184	3,796	36,009	141	243	1,423	20,754
1997	169	1,459	20,126	61	377	2,294	8,239
1998	752	5,477	36,308	297	893	4,301	17,462
1999	313	4,417	17,927	562	129	331	7,468
2000	730	2,721	21,407	79	198	785	9,818
2001	679	3,484	18,196	178	300	764	14,647
2002	574	2,872	21,077	236	227	860	14,261
2003	1,090	2,124	32,340	321	443	2,040	15,542
2004	1,784	2,571	22,535	121	493	1,284	18,173
2005	2,159	2,366	24,497	269	774	1,635	15,585
2006	2,730	1,577	18,271	106	516	942	11,991
2007	1,155	6,897	23,544	412	171	1,010	14,269
	2.1%	7.6%	54.4%	0.5%	0.8%	3.2%	31.4%

Draft Amendment 3
Discards Allocations

Year	Barndoor	Clearnose	Little	Rosette	Smooth	Thorny	Winter
1964							
1965							
1966							
1967							
1968							
1969							
1970							
1971							
1972							
1973							
1974							
1975							
1976							
1977							
1978							
1979							
1980							
1981							
1982							
1983	49,231	15,635	64,866	15,635	15,635	49,231	64,866
1984	49,231	15,635	64,866	15,635	15,635	49,231	64,866
1985	49,231	15,635	64,866	15,635	15,635	49,231	64,866
1986	49,231	15,635	64,866	15,635	15,635	49,231	64,866
1987	49,231	15,635	64,866	15,635	15,635	49,231	64,866
1988	49,231	15,635	64,866	15,635	15,635	49,231	64,866
1989	51,051	7,616	58,667	7,616	7,616	51,051	58,667
1990	71,832	11,161	82,993	11,161	11,161	71,832	82,993
1991	41,045	13,229	54,273	13,229	13,229	41,045	54,273
1992	48,876	29,345	78,221	29,345	29,345	48,876	78,221
1993	33,351	16,822	50,173	16,822	16,822	33,351	50,173
1994	32,212	30,651	62,863	30,651	30,651	32,212	62,863
1995	33,895	21,027	54,922	21,027	21,027	33,895	54,922
1996	27,517	17,937	45,454	17,937	17,937	27,517	45,454
1997	18,714	9,687	28,401	9,687	9,687	18,714	28,401
1998	34,513	13,800	48,314	13,800	13,800	34,513	48,314
1999	19,042	4,203	23,246	4,203	4,203	19,042	23,246
2000	29,204	8,215	37,419	8,215	8,215	29,204	37,419
2001	31,951	2,774	34,725	2,774	2,774	31,951	34,725
2002	34,086	9,828	43,914	9,828	9,828	34,086	43,914
2003	36,959	10,831	47,791	10,831	10,831	36,959	47,791
2004	28,132	3,984	32,116	3,984	3,984	28,132	32,116
2005	19,895	4,900	24,796	4,900	4,900	19,895	24,796
2006	11,001	3,581	14,582	3,581	3,581	11,001	14,582
2007	11,001	3,581	14,582	3,581	3,581	11,001	14,582
	17.5%	6.0%	23.5%	6.0%	6.0%	17.5%	23.5%

Table 27. Survey stratified mean biomass time series used in the rebuilding potential analysis and in estimating catch limits and targets associated with the median C/B exploitation ratio.

Change in Biomass

Year	Barndoor	Clearnose	Little	Rosette	Smooth	Thorny	Winter
1964					-34%		
1965	50%				46%		
1966	-55%				-32%		
1967	-46%				-53%		0%
1968	-35%			-84%	154%	63%	-14%
1969	-81%			-39%	-25%	29%	-29%
1970	23%			369%	-20%	29%	128%
1971	157%			-85%	-32%	-27%	-64%
1972	-44%			1094%	111%	-23%	174%
1973	-96%			-28%	-6%	11%	58%
1974	-100%			3%	-60%	-33%	-55%
1975				-66%	-39%	-19%	-37%
1976	181%	28%		478%	-49%	-30%	102%
1977	-100%	154%	3%	-17%	870%	87%	54%
1978		-80%	3%	-64%	20%	33%	22%
1979		168%	-53%	42%	-60%	-16%	3%
1980	-100%	64%	239%	766%	89%	27%	22%
1981		-75%	-32%	-12%	-65%	-27%	-9%
1982		25%	142%	-92%	-68%	-81%	47%
1983		-34%	58%	-83%	278%	273%	55%
1984		27%	-28%	2791%	36%	20%	4%
1985	-60%	72%	53%	-82%	6%	0%	-31%
1986	642%	78%	-56%	-50%	0%	-43%	72%
1987	-53%	-41%	68%	971%	-54%	-42%	-30%
1988	-46%	5%	10%	-25%	198%	58%	-32%
1989	-35%	-19%	31%	-17%	-55%	27%	-33%
1990	479%	47%	-25%	29%	51%	-10%	41%
1991	10%	130%	20%	-78%	-14%	-4%	-34%
1992	-92%	-63%	-12%	586%	-24%	-41%	-24%
1993	5698%	43%	42%	-38%	79%	72%	-47%
1994	-75%	90%	-52%	240%	-56%	-9%	11%
1995	220%	-65%	-21%	-46%	90%	-48%	-6%
1996	-62%	30%	164%	10%	-7%	4%	15%
1997	149%	43%	-64%	-70%	32%	4%	8%
1998	-15%	83%	176%	284%	-88%	-24%	53%
1999	237%	-6%	34%	34%	149%	-26%	36%
2000	-4%	-2%	-14%	-51%	118%	74%	-14%
2001	89%	56%	-20%	267%	86%	-60%	-11%
2002	43%	-45%	-6%	-57%	-61%	31%	44%
2003	-29%	-26%	1%	-36%	71%	70%	-40%
2004	134%	7%	11%	42%	13%	-4%	19%
2005	-20%	-26%	-55%	37%	-39%	-68%	-35%
2006	13%	1%	3%	-8%	61%	225%	-5%
2007	-32%	60%		17%	-58%	-56%	50%

Change in Biomass 3 year moving average

Year	Barndoor	Clearnose	Little	Rosette	Smooth	Thorny	Winter
1964							
1965							
1966							
1967							
1968					-34%	6%	
1969	-80%				-26%	-24%	
1970	-87%				-5%	15%	
1971	-81%				-21%	22%	
1972	-57%			9%	-13%	31%	32%
1973	-33%			111%	-12%	-20%	41%
1974	-66%			231%	13%	-36%	81%
1975	-94%			6%	-29%	-40%	15%
1976	-76%			37%	-70%	-48%	-30%
1977	-36%			20%	-36%	-37%	-17%
1978	129%			83%	70%	-8%	45%
1979	-86%			-7%	324%	54%	134%
1980	-86%	-4%		120%	99%	69%	103%
1981	-81%	4%	8%	246%	-26%	25%	45%
1982	-100%	-20%	116%	362%	-50%	-23%	42%
1983	-100%	-58%	155%	-20%	-69%	-49%	64%
1984	14%	-58%	208%	-80%	-40%	-49%	103%
1985		-41%	119%	-80%	11%	-5%	75%
1986		97%	21%	-57%	103%	16%	43%
1987	372%	120%	2%	0%	34%	-8%	5%
1988	263%	92%	-22%	46%	6%	-50%	-3%
1989	-40%	-10%	25%	80%	-18%	-42%	-38%
1990	-14%	-14%	22%	69%	18%	-7%	-45%
1991	27%	33%	41%	-13%	-17%	29%	-51%
1992	136%	80%	0%	-7%	-4%	0%	-35%
1993	328%	74%	13%	-1%	-14%	-16%	-48%
1994	175%	11%	-7%	185%	-8%	-21%	-55%
1995	362%	6%	-14%	114%	6%	-8%	-61%
1996	8%	-4%	-25%	155%	-11%	-27%	-38%
1997	45%	-23%	-20%	-26%	32%	-41%	-12%
1998	-18%	23%	27%	-20%	-15%	-41%	41%
1999	162%	64%	43%	-16%	-29%	-36%	77%
2000	162%	133%	98%	57%	-58%	-20%	97%
2001	379%	71%	43%	108%	17%	-29%	57%
2002	226%	27%	9%	58%	67%	-19%	23%
2003	177%	-1%	-24%	38%	133%	-23%	-3%
2004	132%	-39%	-21%	-40%	1%	15%	-3%
2005	79%	-46%	-23%	-29%	-3%	5%	-28%
2006	87%	-44%	-30%	-17%	-5%	10%	-29%
2007	14%	-16%		47%	-16%	-32%	-32%

Stratified mean biomass (kg/tow)

Year	Barndoor	Clearnose	Little	Rosette	Smooth	Thorny	Winter
1964	1.21				0.33		
1965	1.82				0.48		
1966	0.81				0.32		
1967	0.44			0.02	0.15		2.16
1968	0.28			0.00	0.39	4.42	1.86
1969	0.05			0.00	0.29	5.71	1.32
1970	0.07			0.01	0.23	7.35	3.00
1971	0.17			0.00	0.16	5.36	1.08
1972	0.10			0.02	0.33	4.12	2.96
1973	0.00			0.01	0.31	4.56	4.69
1974	-			0.01	0.12	3.04	2.10
1975	0.02	0.24		0.00	0.08	2.47	1.31
1976	0.05	0.30		0.02	0.04	1.72	2.66
1977	-	0.77	1.35	0.02	0.38	3.22	4.10
1978	-	0.16	1.39	0.01	0.45	4.29	4.99
1979	0.01	0.42	0.65	0.01	0.18	3.61	5.12
1980	-	0.68	2.21	0.09	0.34	4.60	6.23
1981	-	0.17	1.50	0.08	0.12	3.34	5.67
1982	-	0.21	3.63	0.01	0.04	0.65	8.31
1983	-	0.14	5.72	0.00	0.15	2.41	12.85
1984	0.01	0.18	4.09	0.03	0.20	2.89	13.32
1985	0.00	0.31	6.26	0.01	0.21	2.88	9.18
1986	0.03	0.54	2.75	0.00	0.21	1.63	15.80
1987	0.01	0.32	4.63	0.03	0.10	0.94	11.06
1988	0.01	0.34	5.08	0.02	0.28	1.49	7.56
1989	0.00	0.27	6.63	0.02	0.13	1.88	5.08
1990	0.03	0.40	4.99	0.02	0.19	1.70	7.15
1991	0.03	0.92	5.99	0.01	0.17	1.63	4.72
1992	0.00	0.34	5.30	0.03	0.13	0.96	3.58
1993	0.14	0.49	7.52	0.02	0.23	1.66	1.91
1994	0.03	0.94	3.62	0.07	0.10	1.51	2.12
1995	0.11	0.33	2.87	0.04	0.19	0.78	1.99
1996	0.04	0.43	7.57	0.04	0.18	0.81	2.28
1997	0.10	0.61	2.71	0.01	0.23	0.85	2.46
1998	0.09	1.12	7.47	0.05	0.03	0.65	3.75
1999	0.30	1.05	9.98	0.07	0.07	0.48	5.09
2000	0.29	1.03	8.60	0.03	0.15	0.83	4.38
2001	0.54	1.61	6.84	0.12	0.29	0.33	3.89
2002	0.78	0.89	6.44	0.05	0.11	0.44	5.60
2003	0.55	0.66	6.49	0.03	0.19	0.74	3.39
2004	1.29	0.71	7.22	0.05	0.21	0.71	4.03
2005	1.04	0.52	3.24	0.06	0.13	0.22	2.61
2006	1.17	0.53	3.32	0.06	0.21	0.73	2.48
2007	0.80	0.85		0.07	0.09	0.32	3.71

Rebuilding prospects

For each managed skate species, the response of survey biomass to changes in catch was examined using the same procedures described in Document 5 of the DEIS Appendix I and the above three catch time series. The results are shown in Figure 48 to Figure 61. This analysis shows whether catch or the relative exploitation ratio (C/B) had any measurable effect on biomass. The top graphs of each panel show a linear least squares regression line and the median value. A negative slope is indicative that high catches lead to low biomass, and vice versa, as would be expected. Positive slopes or no slope are counterintuitive meaning among other things that other factors had more influence over changes in biomass than did the estimated catches.

As was recognized in Document 5 of Appendix I, the relationship between changes in biomass and the catch/biomass ratio are not completely independent, because biomass appears in the denominator of ordinate and the numerator of the abscissa. As a result, the null hypothesis that the slope is significantly different than zero is invalid. Instead, an alternative null hypothesis was developed using a randomization procedure to estimate a slope that resulted if the data were chosen on the basis of random choice alone, but are not truly independent variables.

A randomization test was performed where the change in the three year moving average of biomass and the three year moving average catch/biomass ratio were randomly chosen with replacement, over 1000 iterations in a 20 year artificial time series. The red dashed regression line in each time series represents a threshold where the null hypothesis should be rejected with 95% confidence when the realized slope is less (i.e. more negative). The red dot in each figure represents 2007.

In the Amendment 3 draft, smooth, thorny, and winter skates (all three overfished species) were thought to have a significant relationship between catches and changes in biomass, based on the preponderance of data that biomass increased more frequently when the C/B ratio was below the median value. Other skate species had no such relationship or the slope was counter intuitively positive. The lack of a relationship was attributed to uncertainty in the catch time series, or potentially lagged and poorly understood population dynamics.

The new catch time series and the randomizing test for a significant slope changes this perception. For both sets of winter skate catch estimates (Figure 48 and Figure 49), the C/B slope is not significantly different than no relationship (i.e. cannot reject the null hypothesis with 95% confidence), although the biomass increased 17 out of 19 times for an average of a 54% annual increase when the C/B ratio was below the median. This might have more to do with autocorrelations, because the years with high biomass in the mid-1980s are all clustered below the C/B median.

Thorny skate (Figure 50 and Figure 51) exhibits a flat slope and essentially no relationship between these values, for either catch time series. On the other hand, there does seem to be a significant relationship between C/B and changes in survey biomass for smooth skate (Figure 52 and Figure 53). This relationship appears to be driven by just five years of data, and for the rest of the time series there appears to be no difference in changes in biomass at high catch rates vs. low catch rates.

For rosette skate, the slope between the C/B ratio and changes in biomass are significant and negative, but again this appears to be driven by just two points, which may be related to transient oceanographic conditions in two survey years. Little, clearnose, and barndoor skate all exhibit a flat, non-significant slope.

Even though the relationship between the C/B ratio and changes in skate biomass appear in some cases to make sense and indicate that low catches are more likely than not to cause increases in biomass and rebuilding, none of the relationships are very strong and are probably not very predictive of rebuilding potential at lower catch levels.

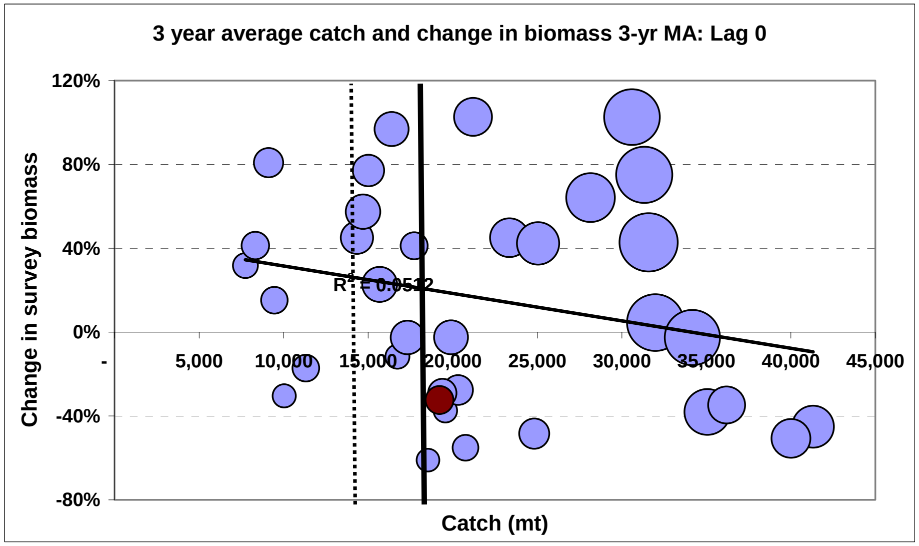
Calculation of catch limits

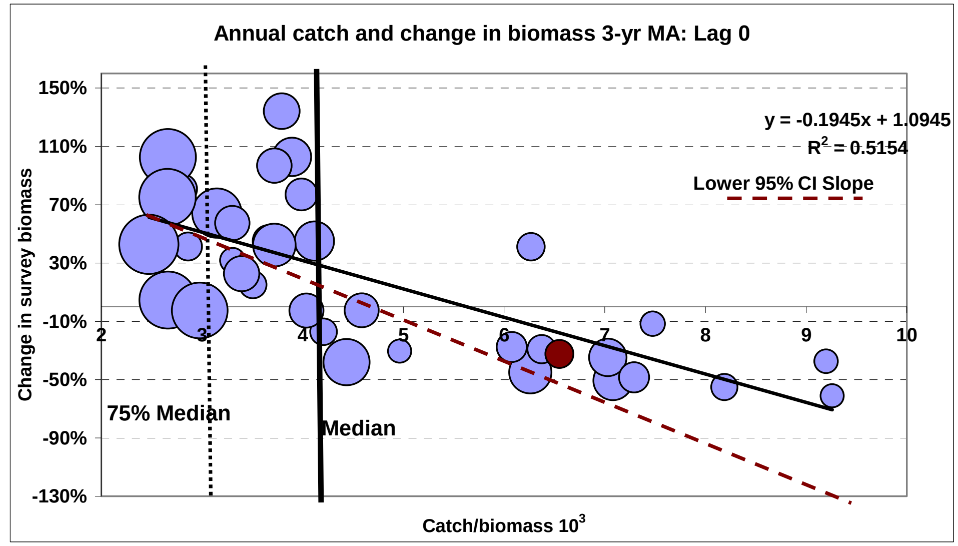
Catch limits and targets defined by the median catch/biomass ratio applied to the annual 3 year moving averages for survey biomass and aggregated over species are shown in Table 28 to Table 32. Using the Draft Amendment 3 catch time series, the perception was that in 2006, catch was close to the target (ACT) and landings were slightly above the TAL. Landings in 2007 had however exceeded the 2007 TAL (the TAL declined due to lower stratified mean biomass[381] values) and landings were approaching the catch target (which includes both landings and discards). It was anticipated that the discard rate in 2007 would be the same as that in 2006, or might have declined from the effects of Framework 42. Due to the increasing landings in 2007 it was however anticipated that the total catch would be above the ABC and that reductions in landings and catch were required. Amendment 3 proposed alternatives to reduce 2007 landings to the TAL. To meet the target, wing fishery landings would need to decline by 45% and bait fishery landings by 43%[382].

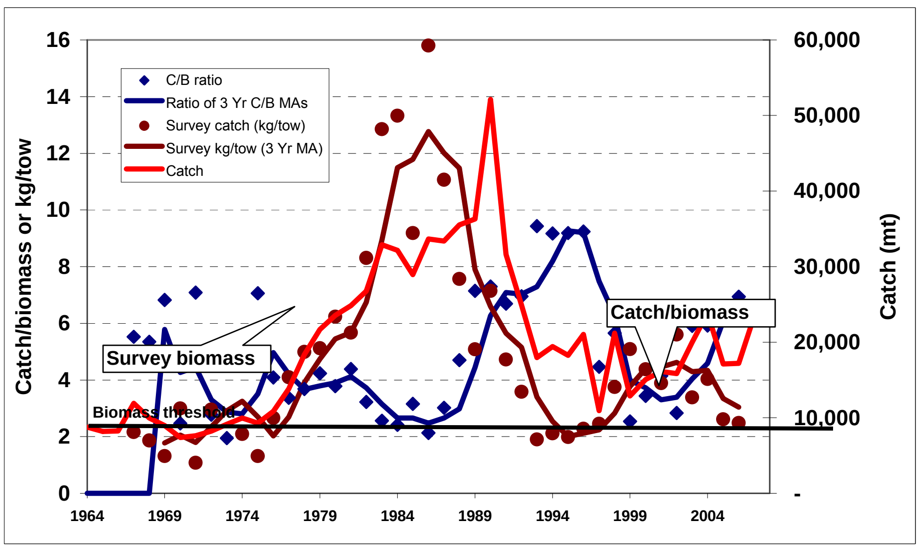
In contrast, the new discard estimates for 2004-2006 are substantially higher than previous estimates. As in the Amendment 3 DEIS, 2007 landings are near the catch target (or ACT). Instead of declining by 65%, the new discard estimates are flat or even increasing in recent years. Thus the fraction of total catch attributable to discards is much higher using these new estimates and results in a much lower TAL. Without action to reduce skate discards, the analyses using the new catch data (Figure 63 and Figure 64) indicate that it would take a 57-60% reduction in skate wing landings and a 63-65% reduction in skate bait landings to prevent the catch from exceeding the ACT.

[381] A considerable portion of the survey biomass decline arises from 2004 dropping out of the three year moving average.
[382] These re-estimated TALs are slightly

Figure 48. Relationship for winter skate between three year moving average of catch (length composition method) and biomass with no lag.







Catch thresholds and historic change in biomass

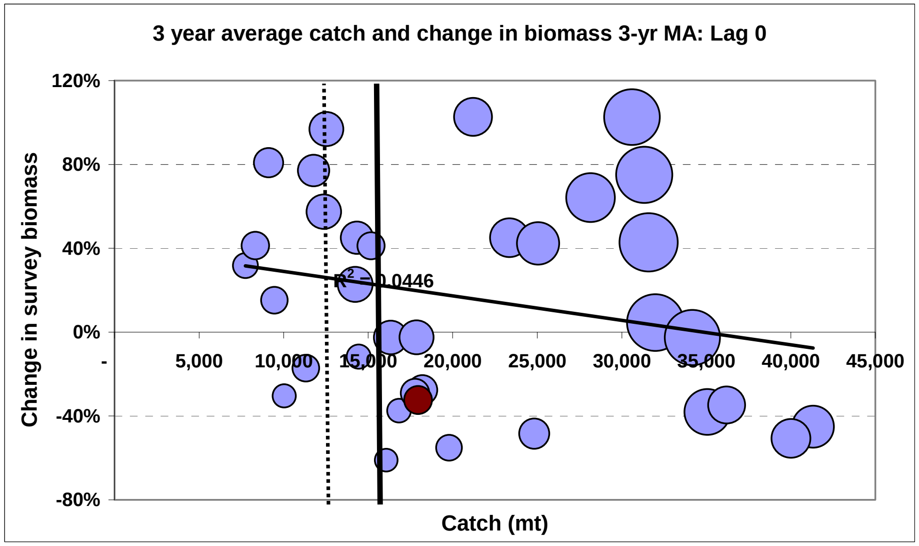
Catch

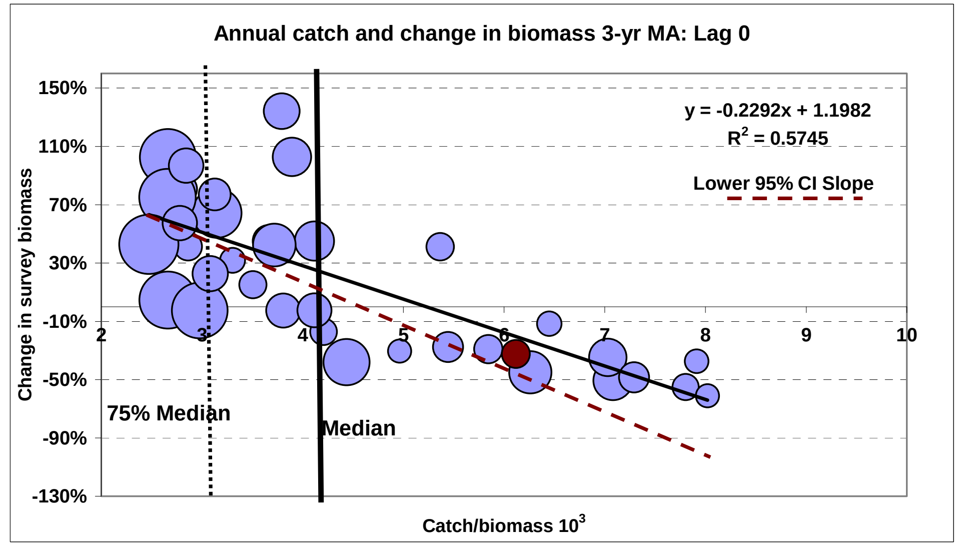
	Limit (mt)	Threshold	Biomass change Up	Down	Average	Δ2004-2006
		All	19	16	16.5%	
Maximum	41,320	Above median	8	12	0.7%	
Median	18,255	Below Median	11	4	42.9%	-6%
80% of media	14,604	Below 80%	5	2	30.5%	-25%
Percentile	31%					

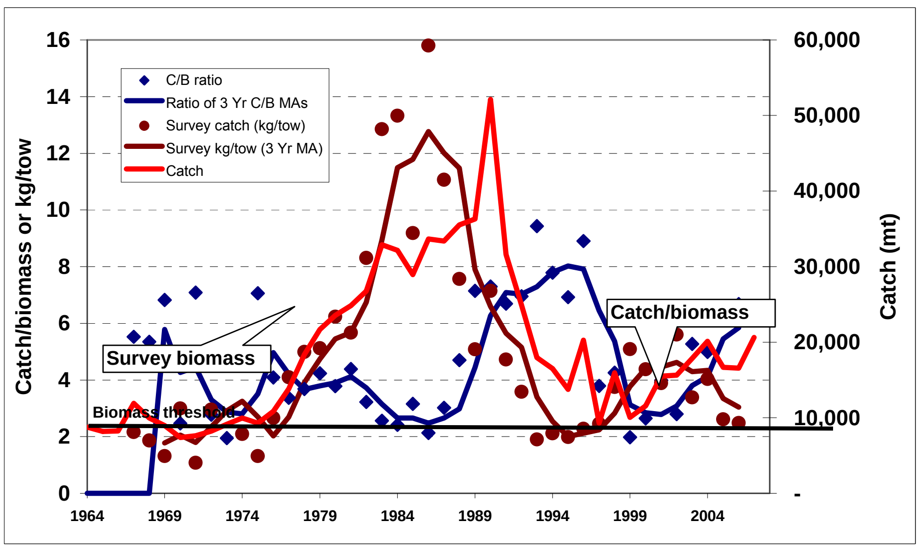
Catch/biomass ratio

		Threshold	Biomass change Up	Down	Average	Limit (mt)	Δ2004-2006
		All	19	16	16.5%		
Maximum	9.26	Above median	2	14	-27.2%		
Median	4.12	Below Median	17	2	54.5%	12,087	-38%
75% of media	3.09	Below 75%	6	1	49.5%	9,065	-53%
Percentile	17%						

Figure 49. Relationship for winter skate between three year moving average of catch (selectivity ogive method) and biomass with no lag.







Catch thresholds and historic change in biomass

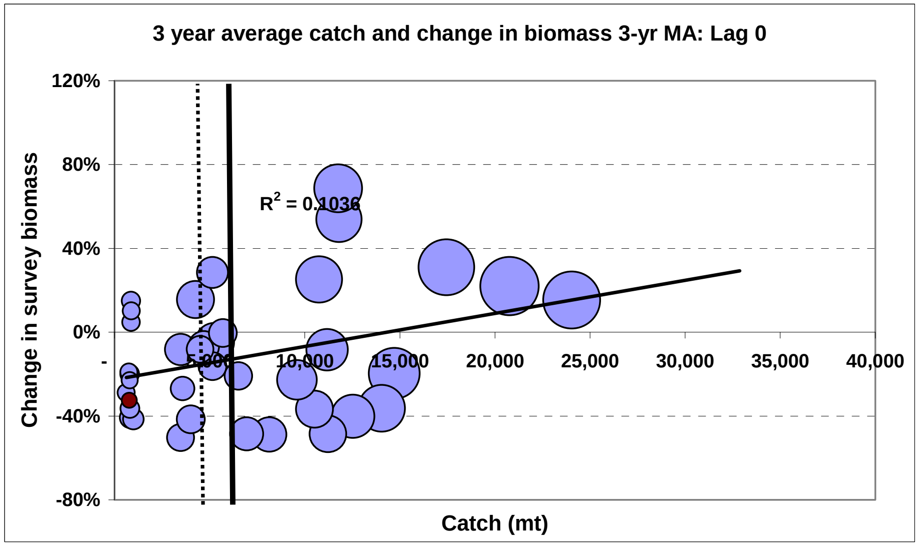
Catch

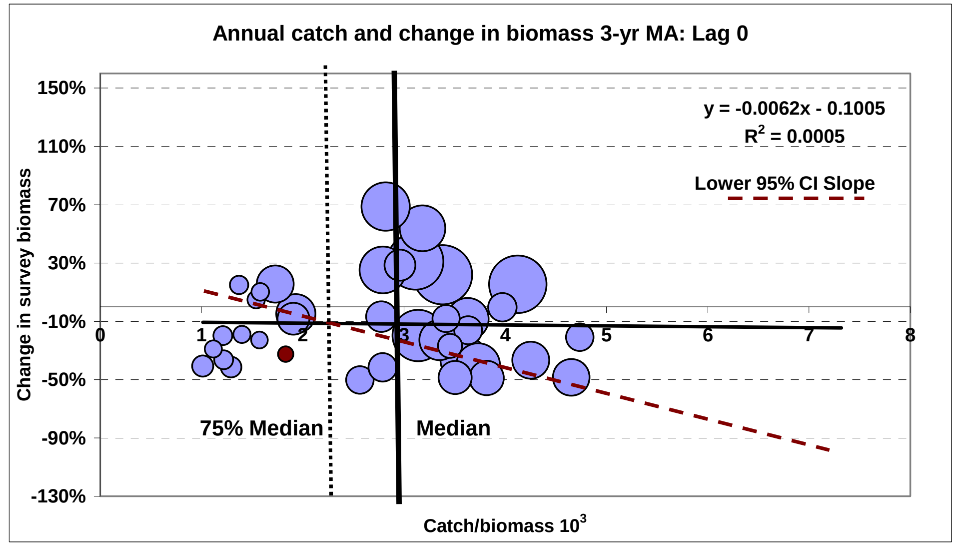
	Limit (mt)	Threshold	Biomass change Up	Down	Average	Δ2004-2006
		All	19	16	16.5%	
Maximum	41,320	Above median	9	11	10.4%	
Median	16,586	Below Median	10	5	33.9%	-7%
80% of medi	13,269	Below 80%	7	2	44.5%	-25%
Percentile	35%					

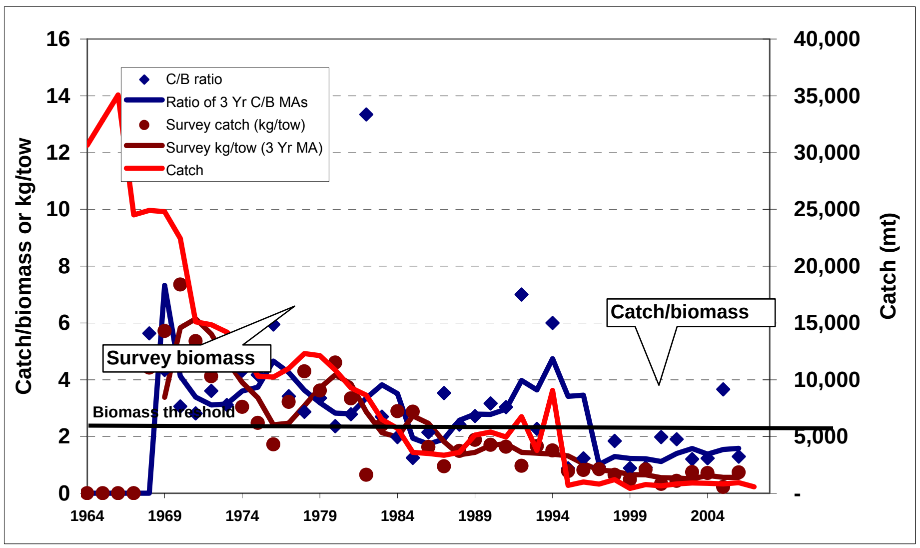
Catch/biomass ratio

		Threshold	Biomass change Up	Down	Average	Limit (mt)	Δ2004-2006
		All	19	16	16.5%		
Maximum	8.02	Above median	2	14	-27.2%		
Median	4.12	Below Median	17	2	54.5%	12,087	-32%
75% of medi	3.09	Below 75%	9	1	52.4%	9,065	-49%
Percentile	24%						

Figure 50. Relationship for thorny skate between three year moving average of catch (length composition method) and biomass with no lag.







Catch thresholds and historic change in biomass

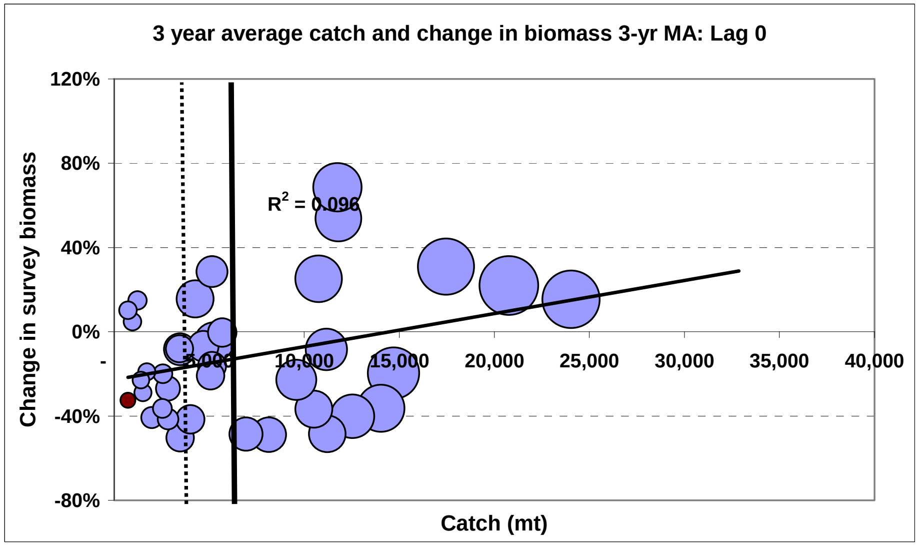
Catch

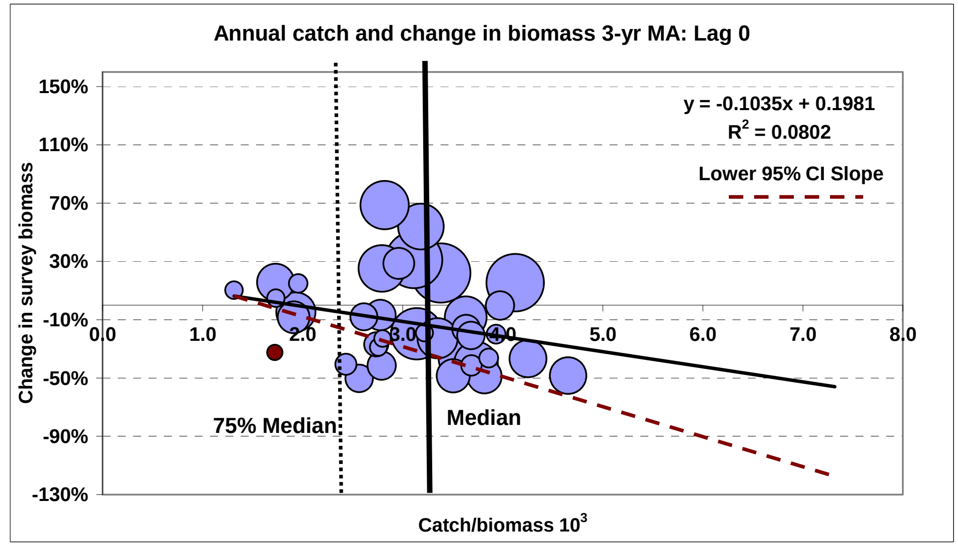
	Limit (mt)	Threshold	Biomass change Up	Down	Average	Δ2004-2006
		All	11	26	-11.8%	
Maximum	32,864	Above median	6	10	-9.5%	
Median	5,479	Below Median	5	16	3.5%	524%
80% of medi	4,383	Below 80%	4	12	2.8%	399%
Percentile	38%					

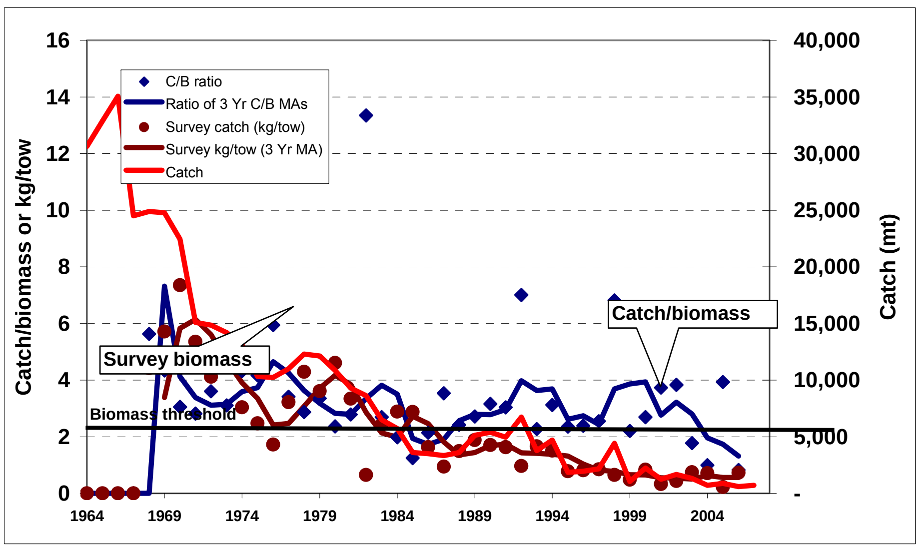
Catch/biomass ratio

			Biomass change Up	Down	Average	Limit (mt)	Δ2004-2006
		All	11	26	-11.8%		
Maximum	7.32	Above median	5	13	-12.9%		
Median	2.96	Below Median	6	13	7.3%	1,258	43%
75% of medi	2.22	Below 75%	4	10	3.2%	944	8%
Percentile	35%						

Figure 51. Relationship for <u>thorny skate</u> between three year moving average of catch (<u>selectivity ogive method</u>) and biomass with no lag.







Catch thresholds and historic change in biomass

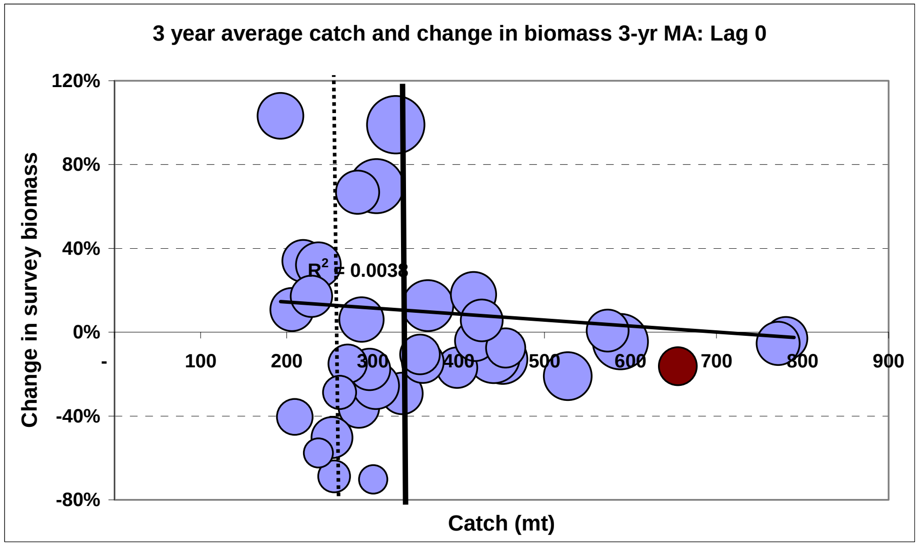
<u>Catch</u>

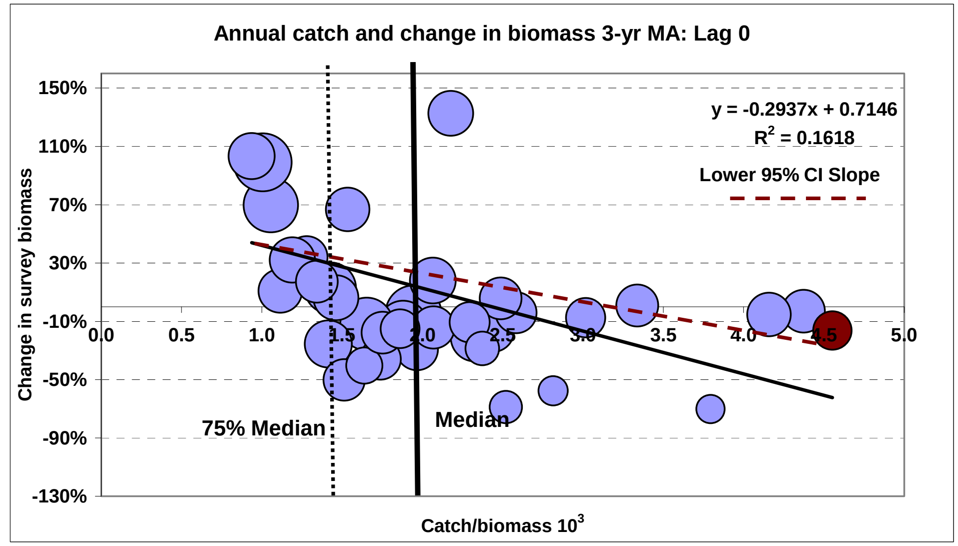
	Limit (mt)	Threshold	Biomass change Up	Down	Average	Δ2004-2006
		All	11	26	-11.8%	
Maximum	32,864	Above median	6	10	-8.5%	
Median	5,209	Below Median	5	16	3.5%	615%
80% of media	4,167	Below 80%	3	13	1.9%	472%
Percentile	38%					

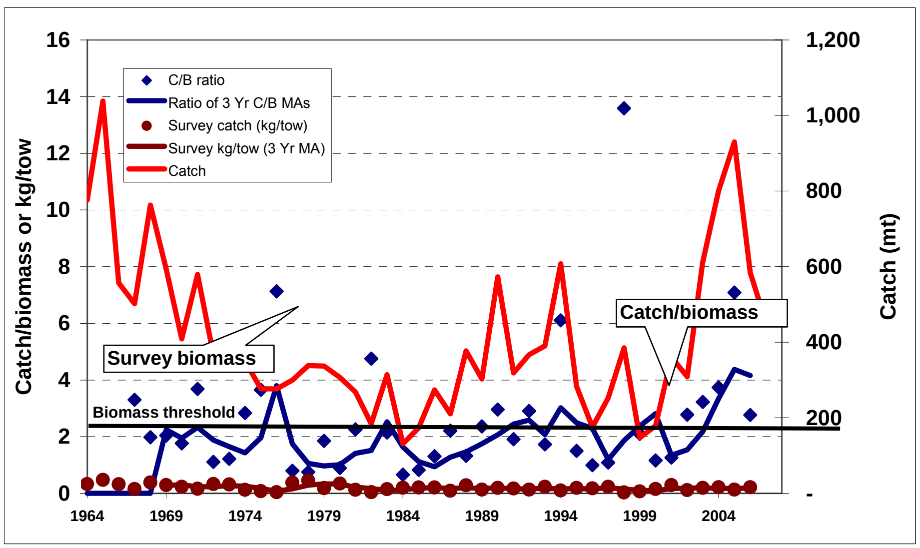
<u>Catch/biomass ratio</u>

		Threshold	Biomass change Up	Down	Average	Limit (mt)	Δ2004-2006
		All	11	26	-11.8%		
Maximum	7.32	Above median	3	15	-20.7%		
Median	3.14	Below Median	8	11	10.5%	1,335	83%
75% of media	2.36	Below 75%	4	3	6.5%	1,001	37%
Percentile	18%						

Figure 52. Relationship for smooth skate between three year moving average of catch (length composition method) and biomass with no lag.







Catch thresholds and historic change in biomass

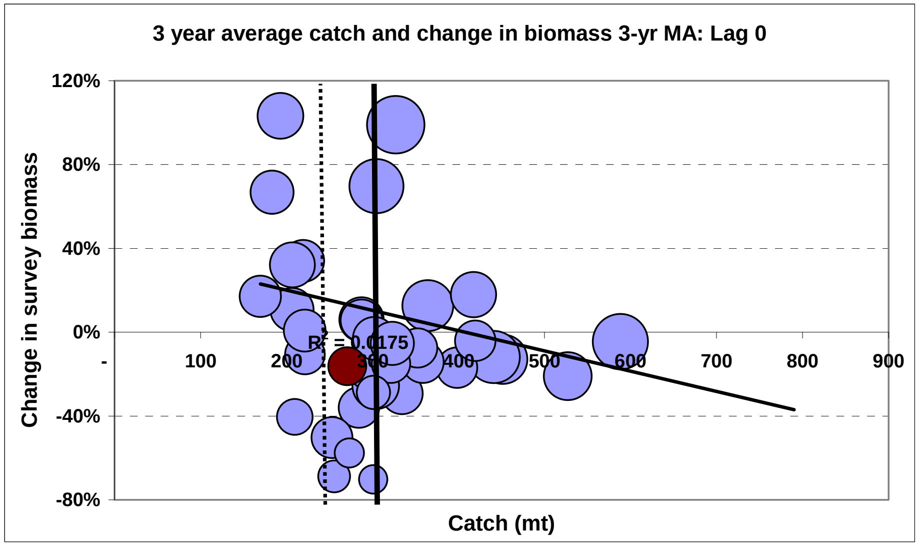
Catch

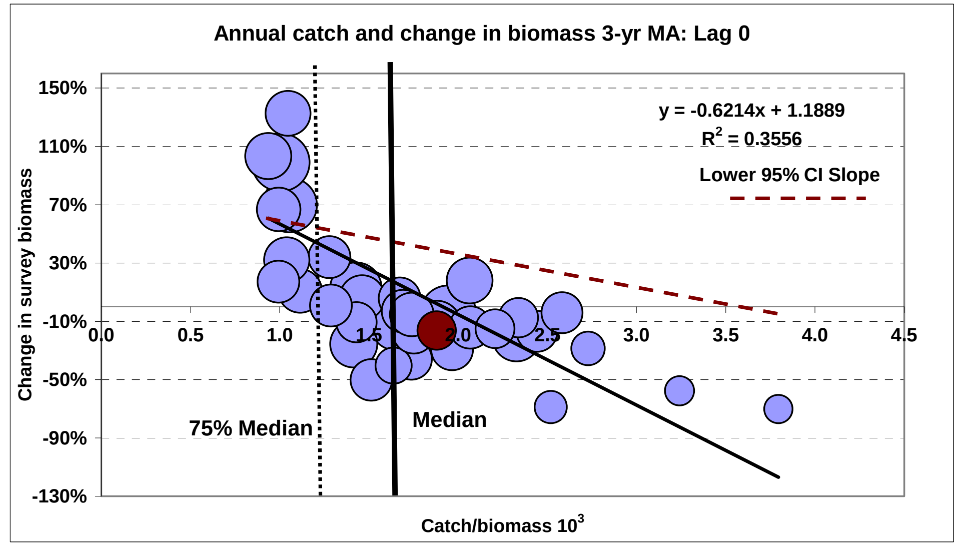
	Limit (mt)	Threshold	Biomass change Up	Down	Average	Δ2004-2006
		All	15	22	9.6%	
Maximum	790	Above median	5	11	4.2%	
Median	345	Below Median	10	11	36.3%	-55%
80% of media	276	Below 80%	5	6	17.9%	-64%
Percentile	25%					

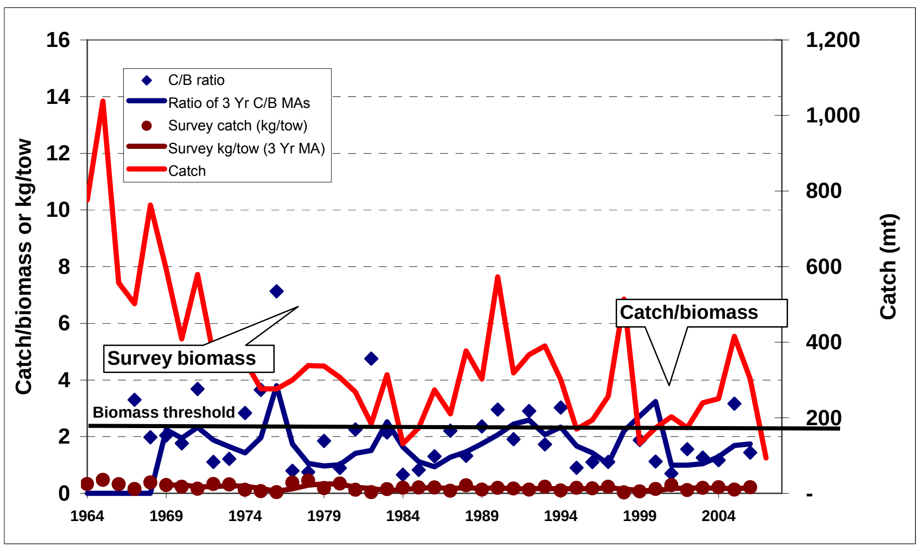
Catch/biomass ratio

		Threshold	Biomass change Up	Down	Average	Limit (mt)	Δ2004-2006
		All	15	22	9.6%		
Maximum	4.55	Above median	4	14	-11.2%		
Median	1.95	Below Median	11	8	40.8%	280	-64%
75% of media	1.46	Below 75%	9	1	70.2%	210	-73%
Percentile	26%						

Figure 53. Relationship for smooth skate between three year moving average of catch (selectivity ogive method) and biomass with no lag.





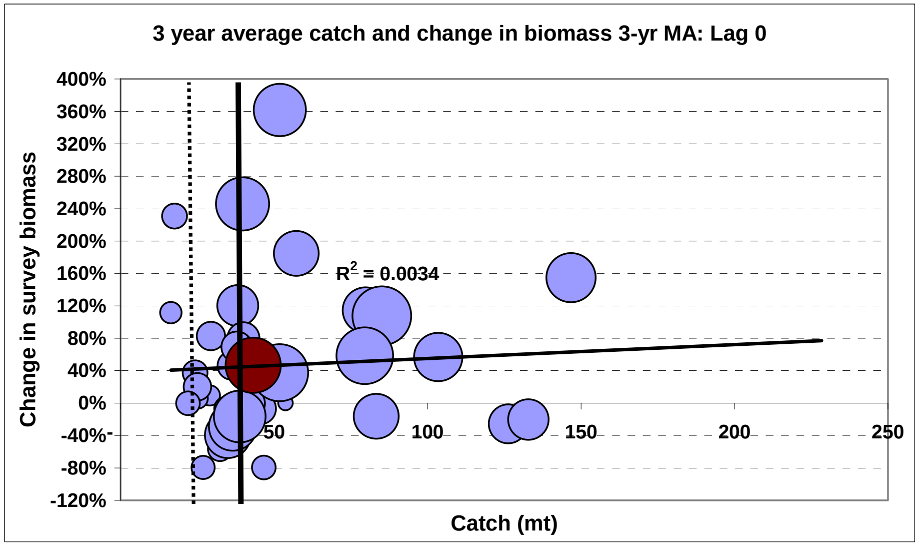


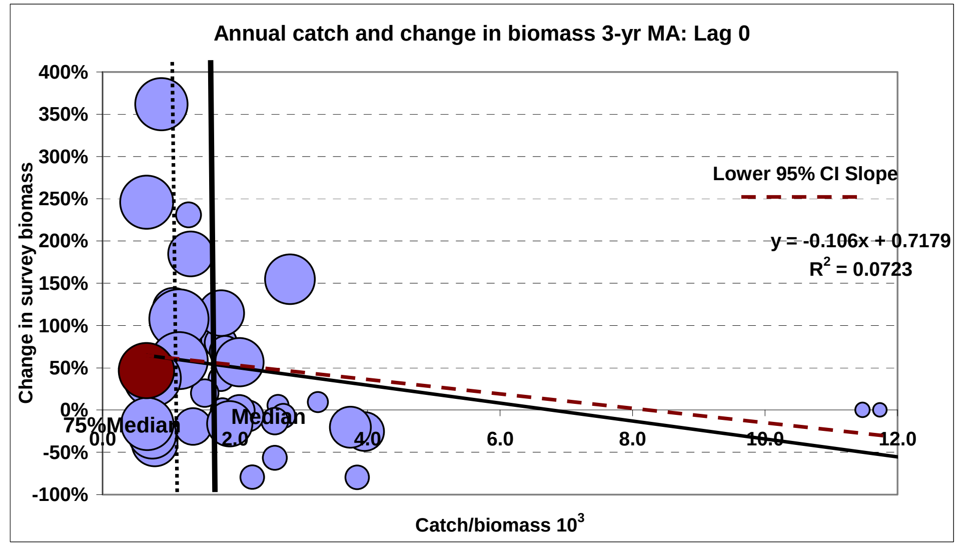
Catch thresholds and historic change in biomass

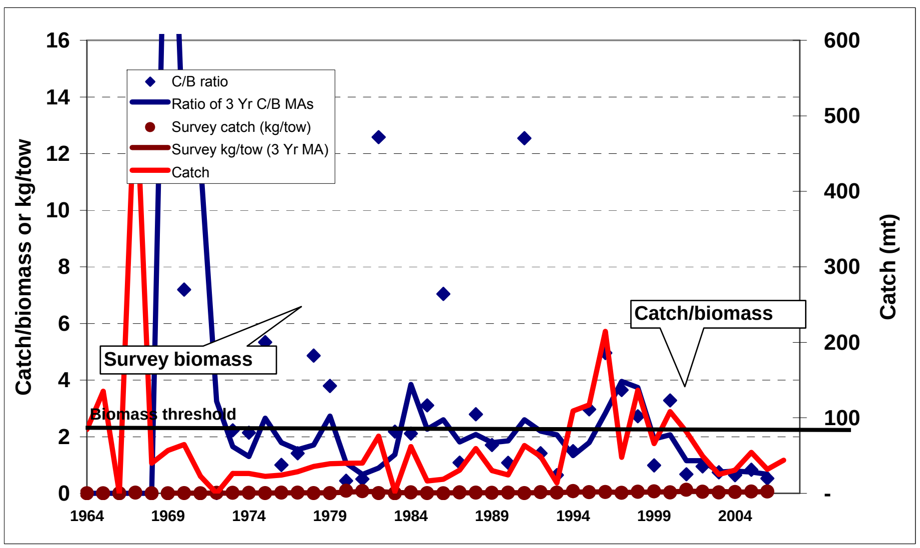
Catch	Limit (mt)	Threshold	Biomass change Up	Down	Average	Δ2004-2006
		All	15	22	9.6%	
Maximum	790	Above median	5	11	23.8%	
Median	303	Below Median	10	11	19.5%	-6%
80% of media	242	Below 80%	8	2	39.7%	-25%
Percentile	24%					

Catch/biomass ratio		Threshold	Biomass change Up	Down	Average	Limit (mt)	Δ2004-2006
		All	15	22	9.6%		
Maximum	3.79	Above median	1	17	-22.9%		
Median	1.69	Below Median	14	5	48.1%	243	-25%
75% of media	1.27	Below 75%	9	0	95.0%	183	-43%
Percentile	24%						

Figure 54. Relationship for rosette skate between three year moving average of catch (length composition method) and biomass with no lag.







Catch thresholds and historic change in biomass

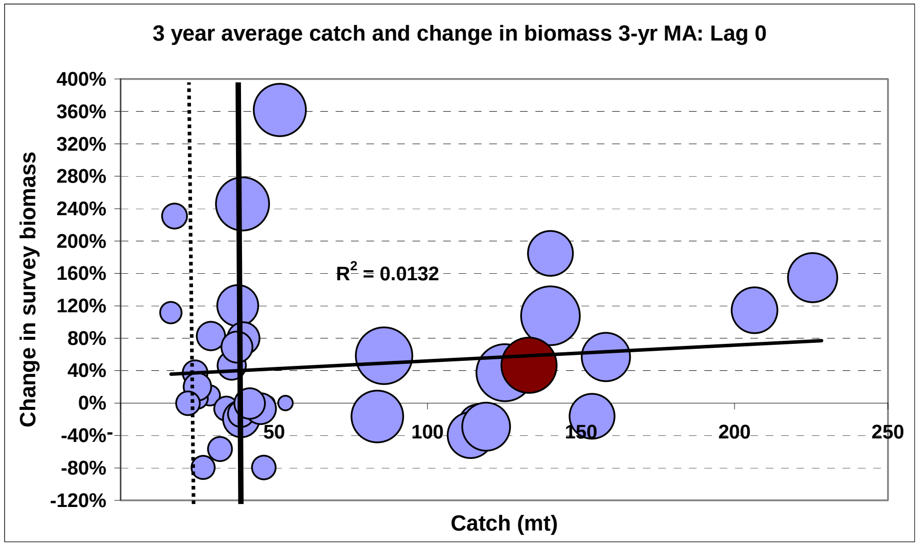
Catch

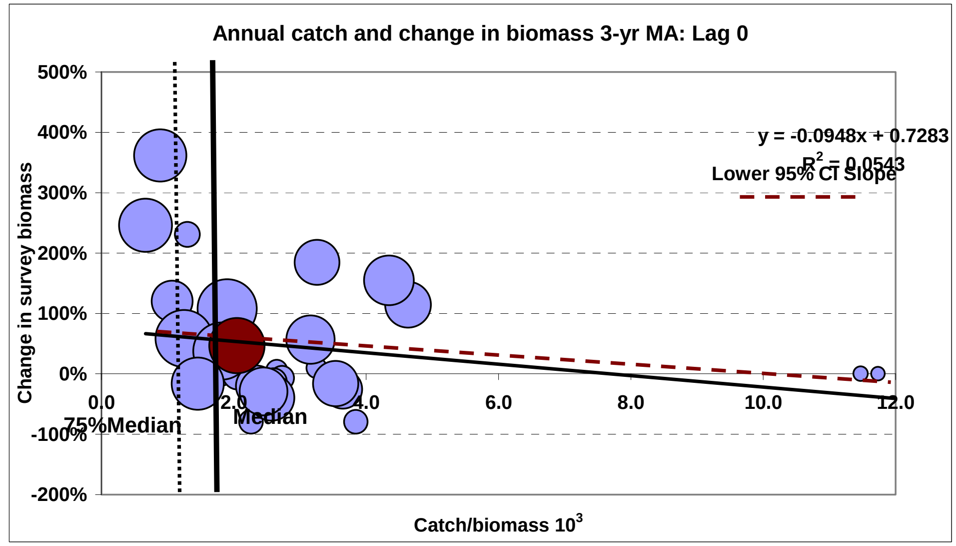
	Limit (mt)	Threshold	Biomass change Up	Down	Average	Δ2004-2006
		All	22	15	46.5%	
Maximum	228	Above median	10	6	60.8%	
Median	41	Below Median	12	9	50.4%	6%
80% of media	33	Below 80%	7	3	49.7%	-16%
Percentile	22%					

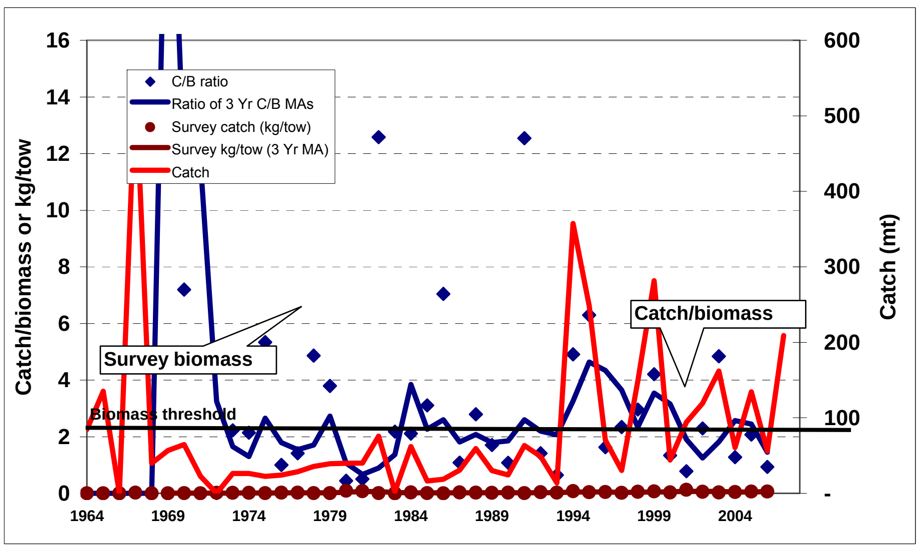
Catch/biomass ratio

		Threshold	Biomass change Up	Down	Average	Limit (mt)	Δ2004-2006
		All	22	15	46.5%		
Maximum	26.36	Above median	7	11	2.0%		
Median	1.81	Below Median	15	4	96.8%	118	203%
75% of media	1.36	Below 75%	9	3	116.1%	88	128%
Percentile	31%						

Figure 55. Relationship for <u>rosette skate</u> between three year moving average of catch (<u>selectivity ogive method</u>) and biomass with no lag.







Catch thresholds and historic change in biomass

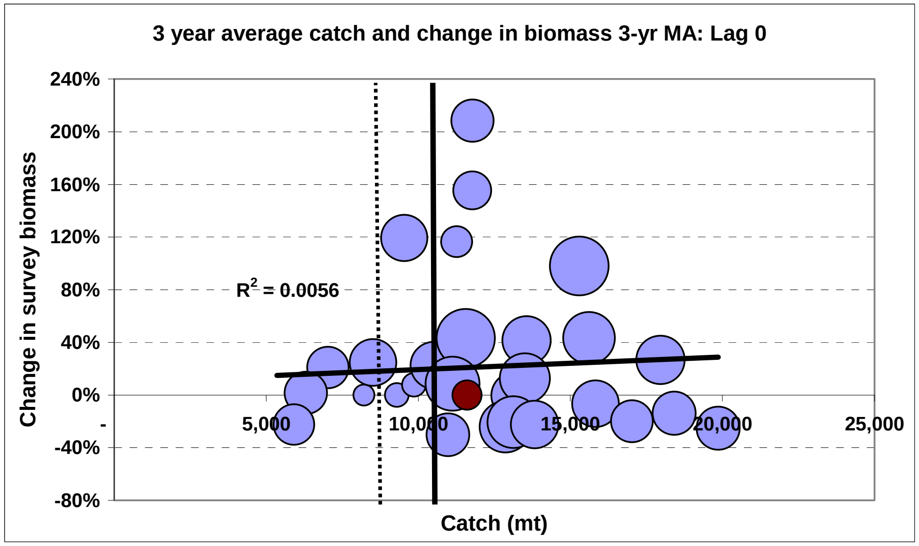
Catch

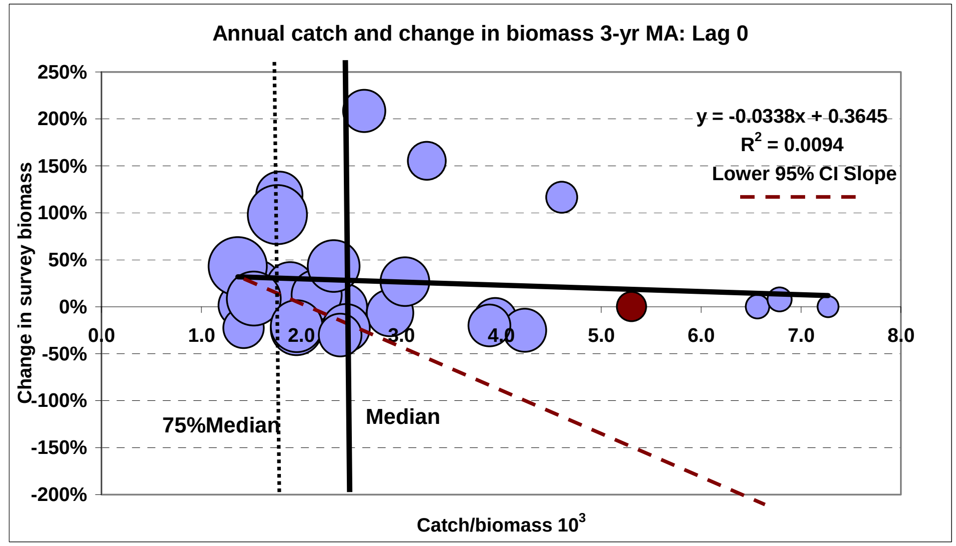
	Limit (mt)	Threshold	Biomass change Up	Down	Average	Δ2004-2006
		All	22	15	46.5%	
Maximum	228	Above median	10	6	60.9%	
Median	47	Below Median	12	9	50.4%	-43%
80% of media	38	Below 80%	8	4	45.3%	-55%
Percentile	29%					

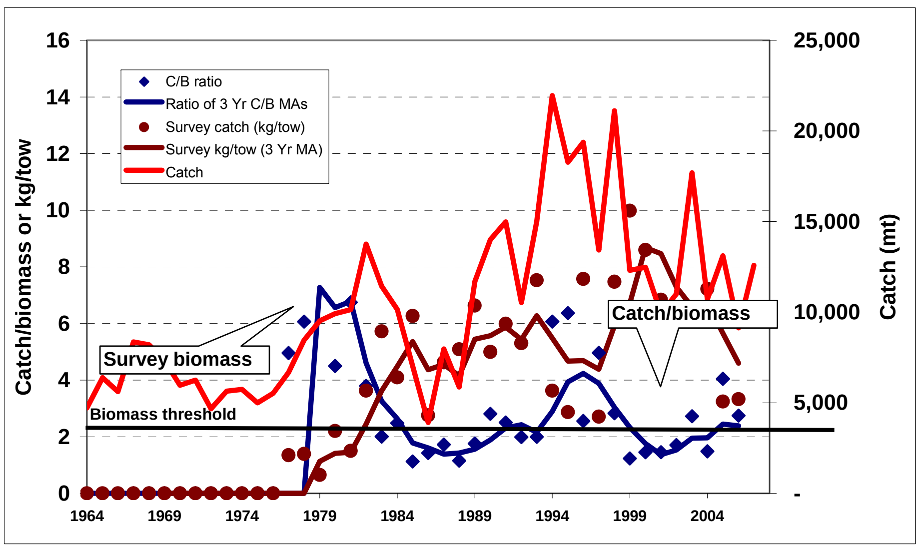
Catch/biomass ratio

		Threshold	Biomass change Up	Down	Average	Limit (mt)	Δ2004-2006
		All	22	15	46.5%		
Maximum	26.36	Above median	7	11	8.4%		
Median	2.19	Below Median	15	4	87.1%	143	70%
75% of media	1.65	Below 75%	6	2	129.6%	107	28%
Percentile	21%						

Figure 56. Relationship for little skate between three year moving average of catch (length composition method) and biomass with no lag.







Catch thresholds and historic change in biomass

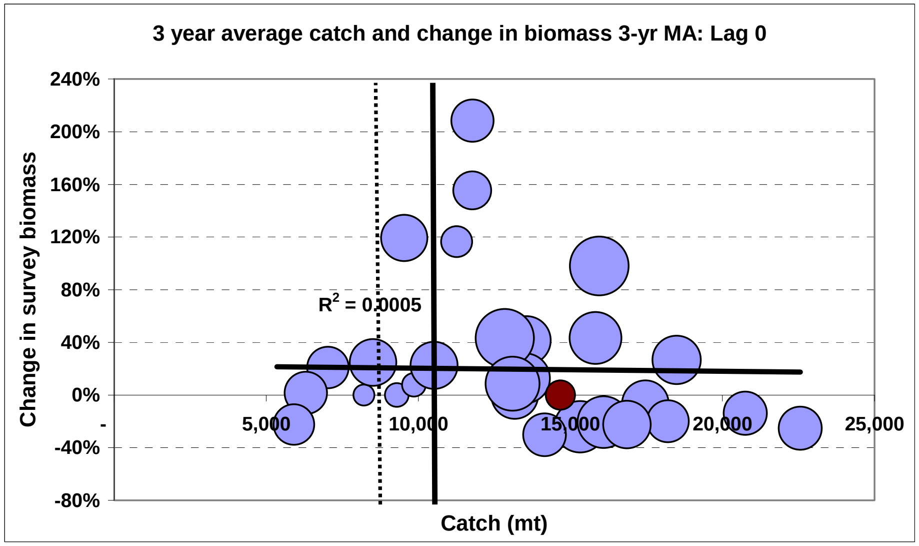
Catch

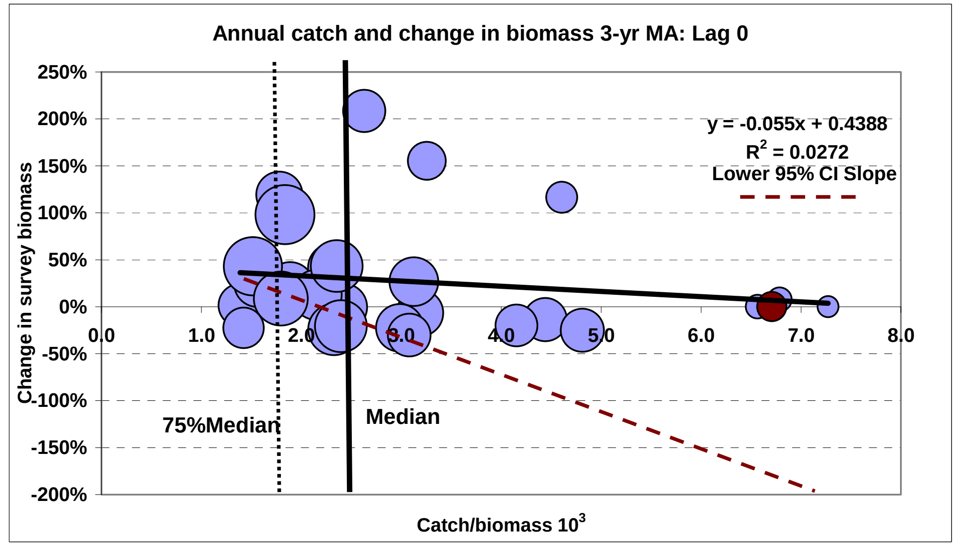
	Limit (mt)	Threshold	Biomass change Up	Down	Average	Δ2004-2006
		All	27	10	20.1%	
Maximum	19,866	Above median	22	9	19.8%	
Median	10,189	Below Median	5	1	29.0%	-7%
80% of media	8,151	Below 80%	2	1	7.5%	-26%
Percentile	38%					

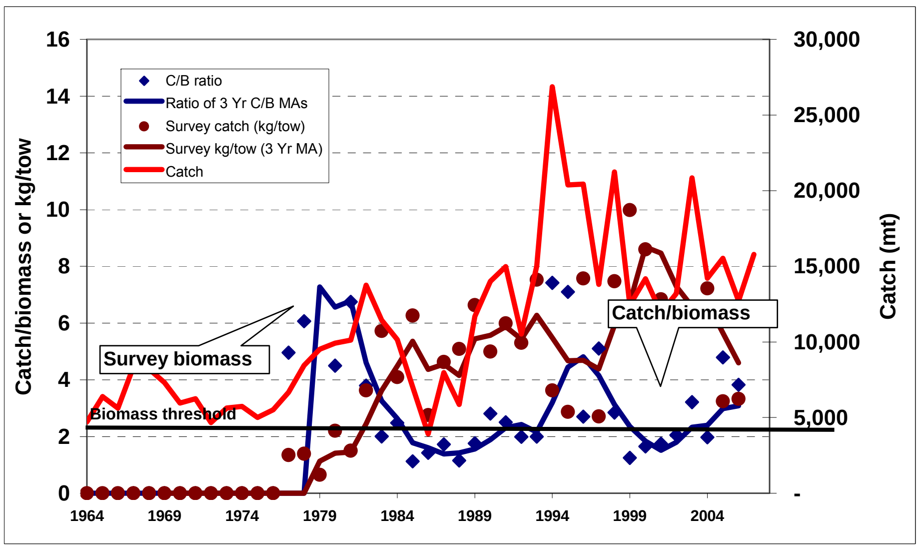
Catch/biomass ratio

			Biomass change Up	Down	Average	Limit (mt)	Δ2004-2006
		All	27	10	20.1%		
Maximum	7.27	Above median	16	7	17.2%		
Median	2.39	Below Median	11	3	31.1%	5,230	-52%
75% of media	1.79	Below 75%	7	1	39.5%	3,922	-64%
Percentile	25%						

Figure 57. Relationship for little skate between three year moving average of catch (selectivity ogive method) and biomass with no lag.







Catch thresholds and historic change in biomass

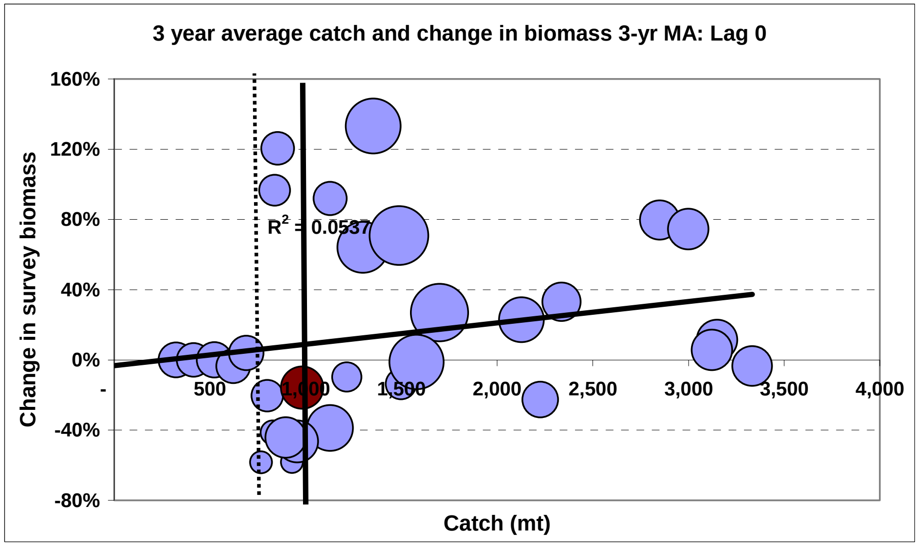
Catch

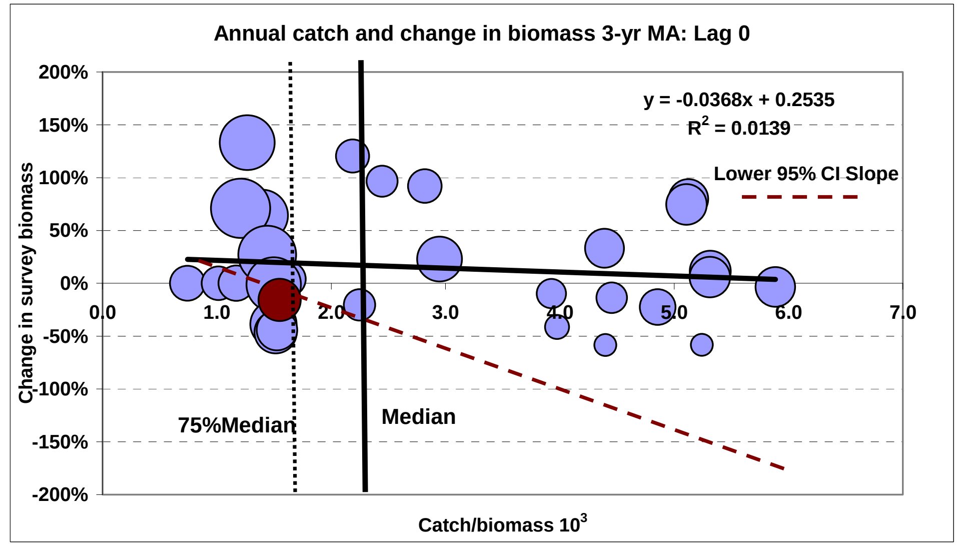
	Limit (mt)	Threshold	Biomass change Up	Down	Average	Δ2004-2006
		All	27	10	20.1%	
Maximum	22,562	Above median	22	9	19.8%	
Median	10,189	Below Median	5	1	29.0%	-28%
80% of media	8,151	Below 80%	2	1	7.5%	-42%
Percentile	38%					

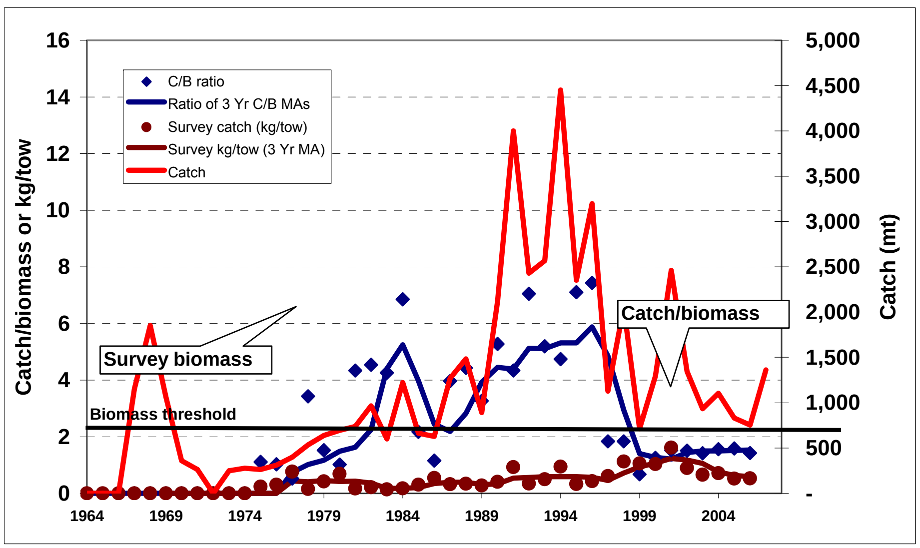
Catch/biomass ratio

		Threshold	Biomass change Up	Down	Average	Limit (mt)	Δ2004-2006
		All	27	10	20.1%		
Maximum	7.27	Above median	16	7	17.2%		
Median	2.43	Below Median	11	3	31.1%	5,312	-62%
75% of media	1.82	Below 75%	6	1	31.1%	3,984	-72%
Percentile	24%						

Figure 58. Relationship for clearnose skate between three year moving average of catch (length composition method) and biomass with no lag.







Catch thresholds and historic change in biomass

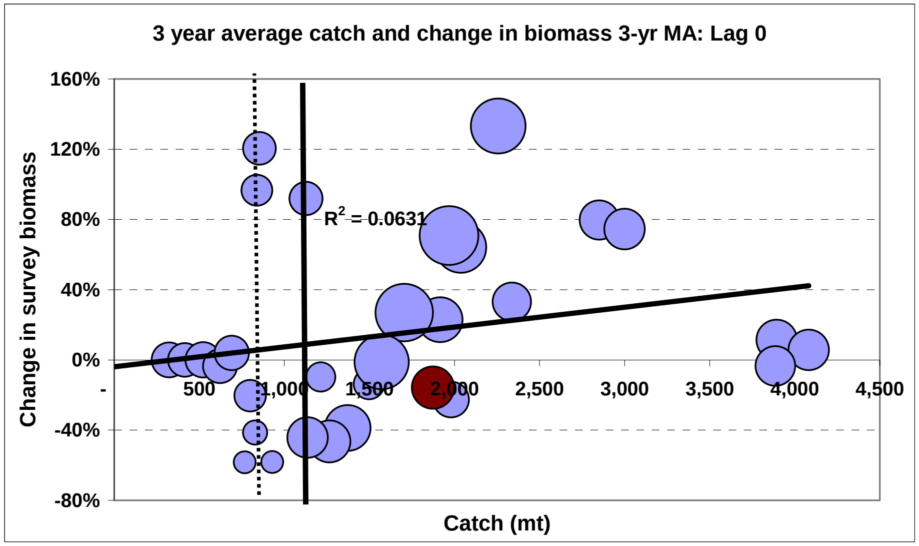
Catch

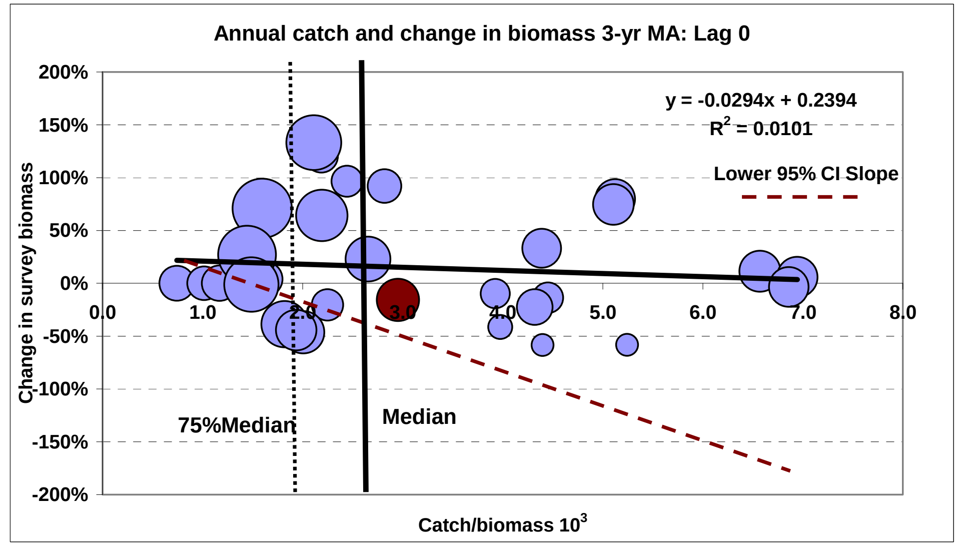
	Limit (mt)	Threshold	Biomass change Up	Down	Average	Δ2004-2006
		All	24	13	12.0%	
Maximum	3,334	Above median	21	6	18.8%	
Median	969	Below Median	3	7	22.1%	8%
80% of media	776	Below 80%	1	2	1.3%	-13%
Percentile	32%					

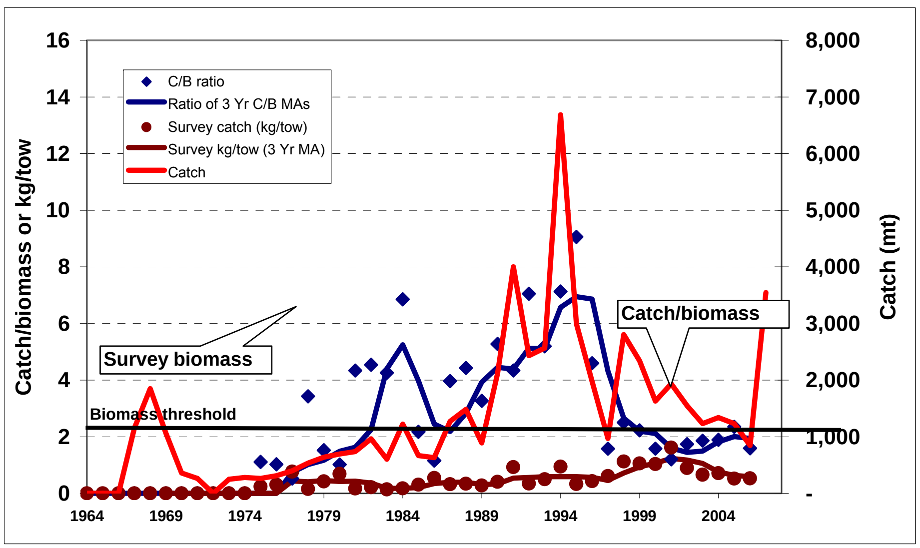
Catch/biomass ratio

			Biomass change Up	Down	Average	Limit (mt)	Δ2004-2006
		All	24	13	12.0%		
Maximum	5.89	Above median	18	7	7.5%		
Median	2.25	Below Median	6	6	34.9%	1,427	59%
75% of media	1.69	Below 75%	5	6	27.2%	1,070	19%
Percentile	44%						

Figure 59. Relationship for clearnose skate between three year moving average of catch (selectivity ogive method) and biomass with no lag.







Catch thresholds and historic change in biomass

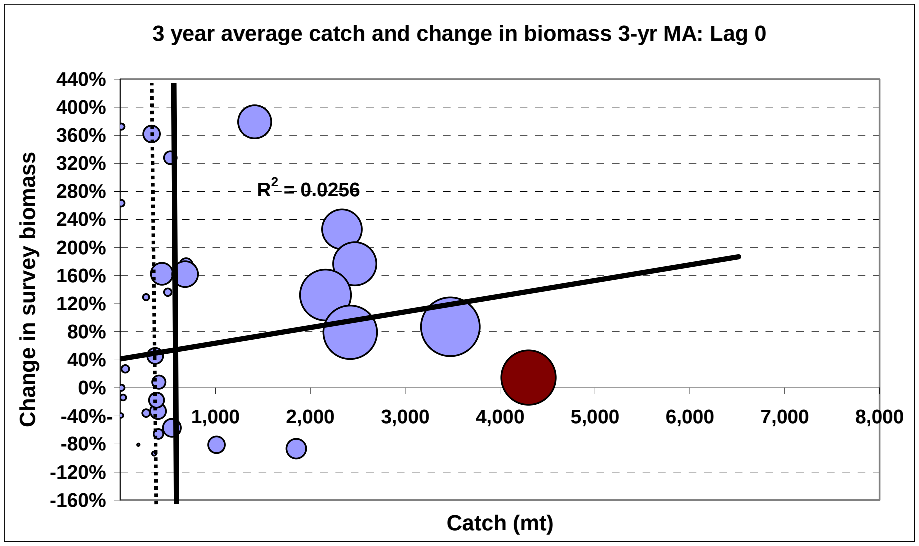
Catch

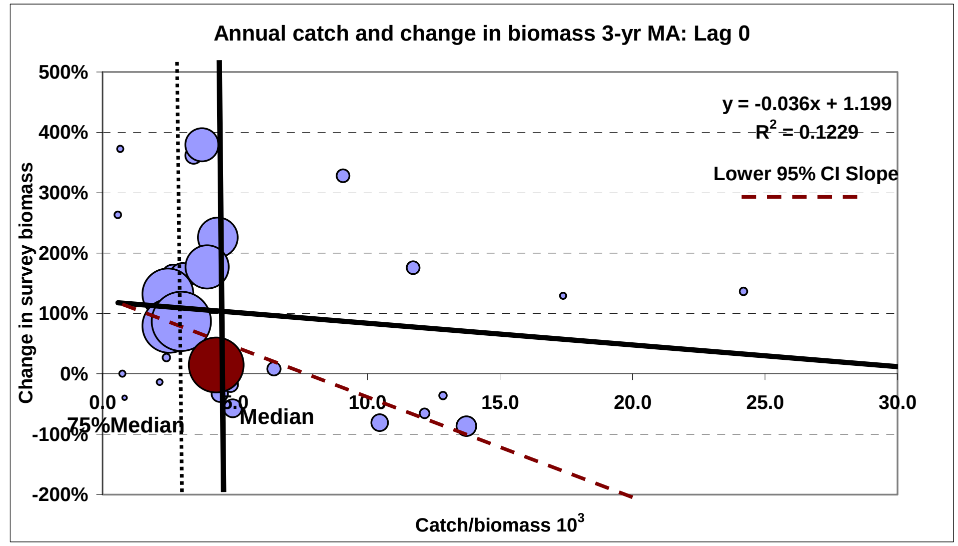
	Limit (mt)	Threshold	Biomass change Up	Down	Average	Δ2004-2006
		All	24	13	12.0%	
Maximum	4,082	Above median	21	8	14.4%	
Median	1,110	Below Median	3	5	27.6%	-2%
80% of media	888	Below 80%	3	4	31.5%	-22%
Percentile	43%					

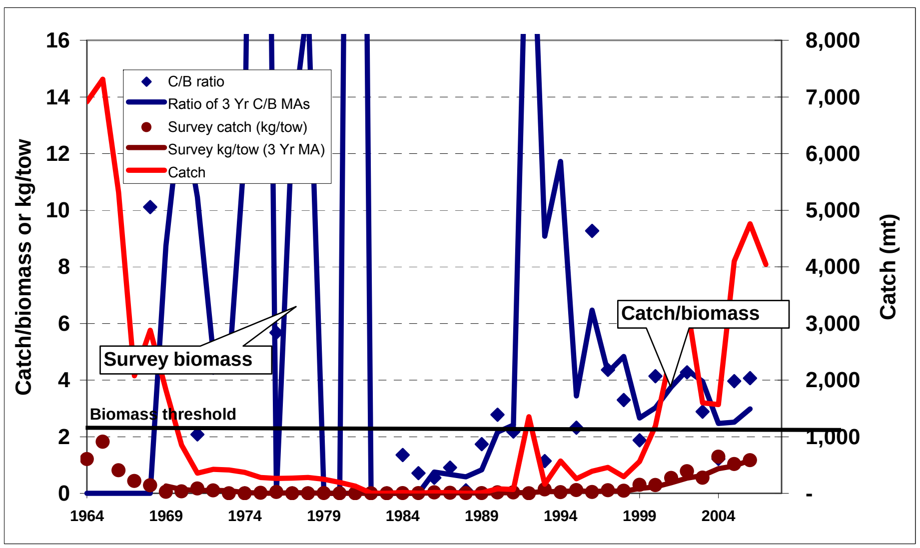
Catch/biomass ratio

		Threshold	Biomass change Up	Down	Average	Limit (mt)	Δ2004-2006
		All	24	13	12.0%		
Maximum	6.94	Above median	18	7	7.7%		
Median	2.44	Below Median	6	6	34.9%	1,551	36%
75% of media	1.83	Below 75%	3	3	16.9%	1,164	2%
Percentile	27%						

Figure 60. Relationship for barndoor skate between three year moving average of catch (length composition method) and biomass with no lag.





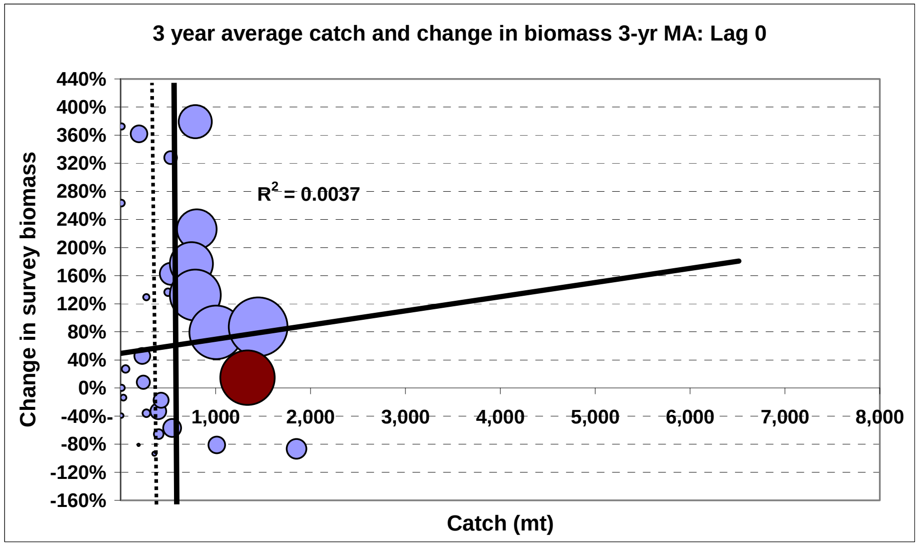


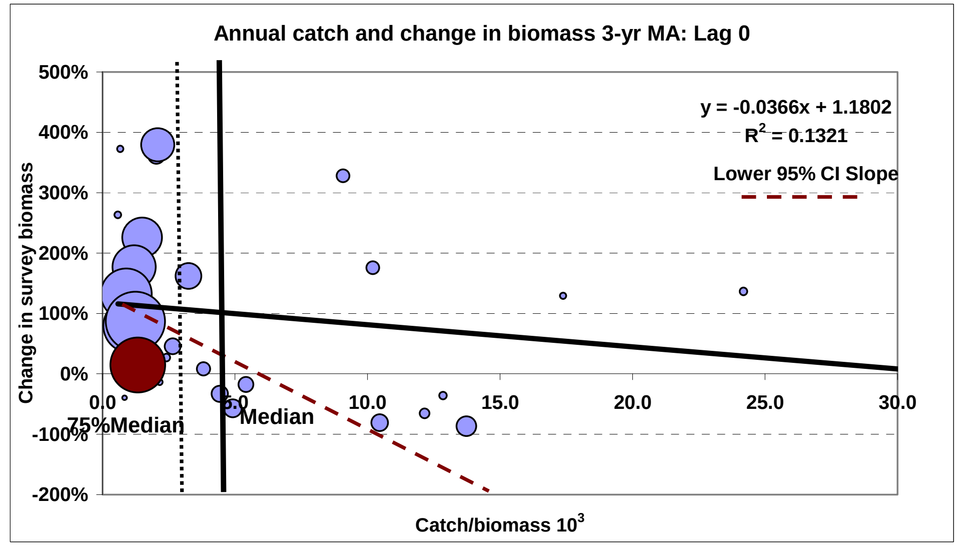
Catch thresholds and historic change in biomass

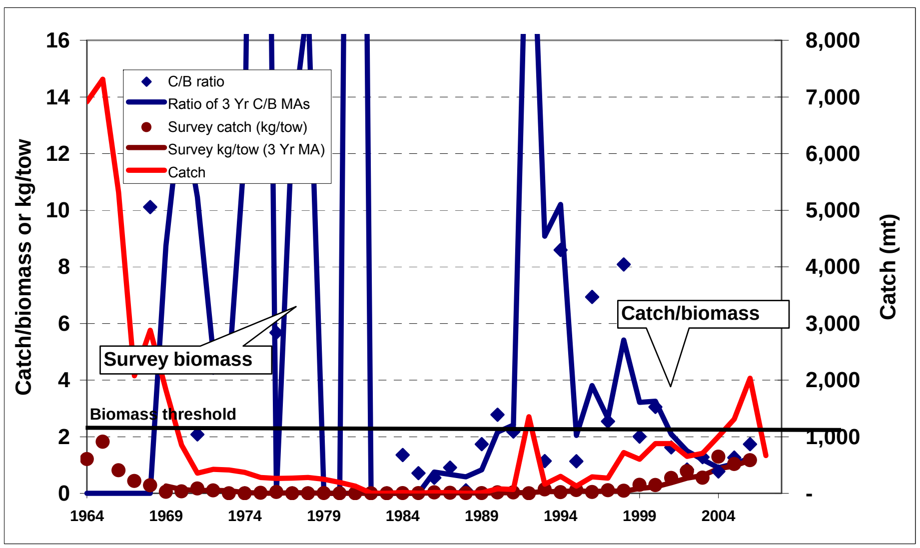
Catch	Limit (mt)	Threshold	Biomass change Up	Down	Average	Δ2004-2006
		All	21	16	58.5%	
Maximum	6,514	Above median	14	4	108.0%	
Median	400	Below Median	7	12	63.9%	-88%
80% of media	320	Below 80%	5	9	57.6%	-91%
Percentile	38%					

Catch/biomass ratio			Biomass change Up	Down	Average	Limit (mt)	Δ2004-2006
		All	21	16	58.5%		
Maximum	64.47	Above median	8	14	0.7%		
Median	4.32	Below Median	13	2	150.9%	4,332	25%
75% of media	3.24	Below 75%	8	2	128.5%	3,249	-7%
Percentile	34%						

Figure 61. Relationship for barndoor skate between three year moving average of catch (selectivity ogive method) and biomass with no lag.







Catch thresholds and historic change in biomass

Catch

	Limit (mt)	Threshold	Biomass change Up	Down	Average	Δ2004-2006
		All	21	16	58.5%	
Maximum	6,514	Above median	13	5	106.6%	
Median	400	Below Median	8	11	64.3%	-72%
80% of media	320	Below 80%	8	9	71.8%	-78%
Percentile	45%					

Catch/biomass ratio

			Biomass change Up	Down	Average	Limit (mt)	Δ2004-2006
		All	21	16	58.5%		
Maximum	64.47	Above median	8	14	-2.2%		
Median	3.23	Below Median	13	2	155.1%	3,237	123%
75% of media	2.42	Below 75%	11	2	163.0%	2,428	68%
Percentile	42%						

Table 28. Calculation of alternative skate catch limits using catch and catch/biomass medians from Draft Amendment 3, using corrected discards.

	Catch		C/B derived catch limits	
Species	Median	80% of medi	Median	75% of medi
Barndoor	290	232	2,685	2,014
Clearnose	521	417	614	460
Little	17,524	14,019	7,649	5,737
Rosette	26	21	56	42
Smooth	33	26	27	20
Thorny	155	124	50	38
Winter	17,422	13,938	11,530	8,648
Total	35,971	28,777	22,612	16,959
Discards	13,734	10,987	8,634	6,475
Prohibited species	430	344	2,486	1,865
Legal species	13,305	10,644	6,147	4,611
Discard rate legal sp	37%	37%	31%	31%
Allowable landings	22,237	17,789	13,978	10,484
Prohibited species	48	38	276	207
Legal species	22,189	17,751	13,702	10,277
Wing fishery TAL	15,502	12,402	10,351	7,763
Change from 2007	10%	-12%	-26%	-45%
Bait fishery TAL	6,735	5,388	3,627	2,721
Change from 2007	41%	13%	-24%	-43%
TAL	22,237	17,789	13,978	10,484
Discards	13,734	10,987	8,634	6,475
TAC	35,971	28,777	22,612	16,959
Change from 2007	39%	11%	-13%	-34%

Figure 62. Trend in annual ABC, ACT, and TALs derived from applying the median catch/biomass ratio from Draft Amendment 3 catches to historic stratified mean biomass by skate species.

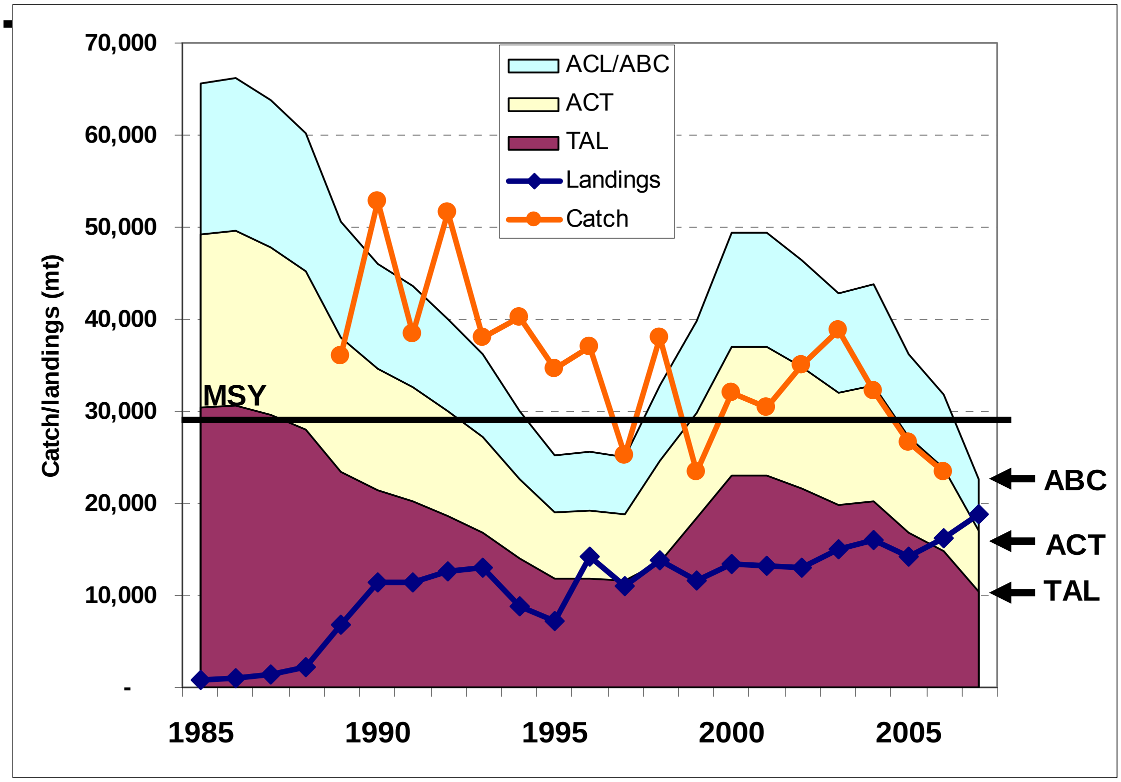


Table 29. Input variables and results application of catch/biomass ratios derived from Draft Amendment 3 catches and applied to stratified mean survey biomass.

Species	Catch/biomass index (thousand mt catch/kg per tow) Median	75% of median	Stratified mean survey weight (kg/tow) 2004-2006	2005-2007	Target
Barndoor	2.68	2.01	1.17	1.00	1.62
Clearnose	0.97	0.73	0.59	0.63	0.56
Little	3.50	2.62	4.59	3.67	6.54
Rosette	0.86	0.65	0.06	0.06	0.03
Smooth	0.19	0.14	0.19	0.14	0.31
Thorny	0.12	0.09	0.55	0.42	4.41
Winter	3.93	2.95	3.04	2.93	6.46
Annual catch limit (ACL/ABC)			31,858	22,612	53,731
Annual catch target (ACT)			23,893	16,959	40,298
Total allowable landings (TAL)			14,770	10,484	29,912

Table 30. Calculation of alternative skate catch limits using catch and catch/biomass medians from the Data Poor Assessment Workshop length composition method.

Species	Catch Median	80% of medi	C/B derived catch limits Median	75% of medi
Barndoor	400	320	4,328	3,246
Clearnose	969	776	1,428	1,072
Little	10,189	8,151	5,230	3,917
Rosette	41	33	77	88
Smooth	345	276	281	210
Thorny	5,479	4,383	1,257	943
Winter	18,255	14,604	12,092	9,069
Total	35,678	28,543	24,692	18,546
Discards	20,699	16,559	14,325	10,759
Prohibited species	5,602	4,481	5,280	3,959
Legal species	15,097	12,078	9,046	6,800
Discard rate legal sp	51%	51%	48%	48%
Allowable landings	14,979	11,984	10,367	7,786
Prohibited species	622	498	587	440
Legal species	14,357	11,486	9,780	7,346
Wing fishery TAL	11,399	9,120	8,022	6,027
Change from 2007	-19%	-35%	-43%	-57%
Bait fishery TAL	3,580	2,864	2,341	1,759
Change from 2007	-25%	-40%	-51%	-63%
TAL	14,979	11,984	10,363	7,786
Discards	20,699	16,559	14,325	10,759
TAC	35,678	28,543	24,688	18,546
Change from 2007	-16%	-33%	-42%	-56%

Figure 63. Trend in annual ABC, ACT, and TALs derived from applying the median catch/biomass ratio from catches using the length composition method to assign catches and apply them to historic stratified mean biomass by skate species.

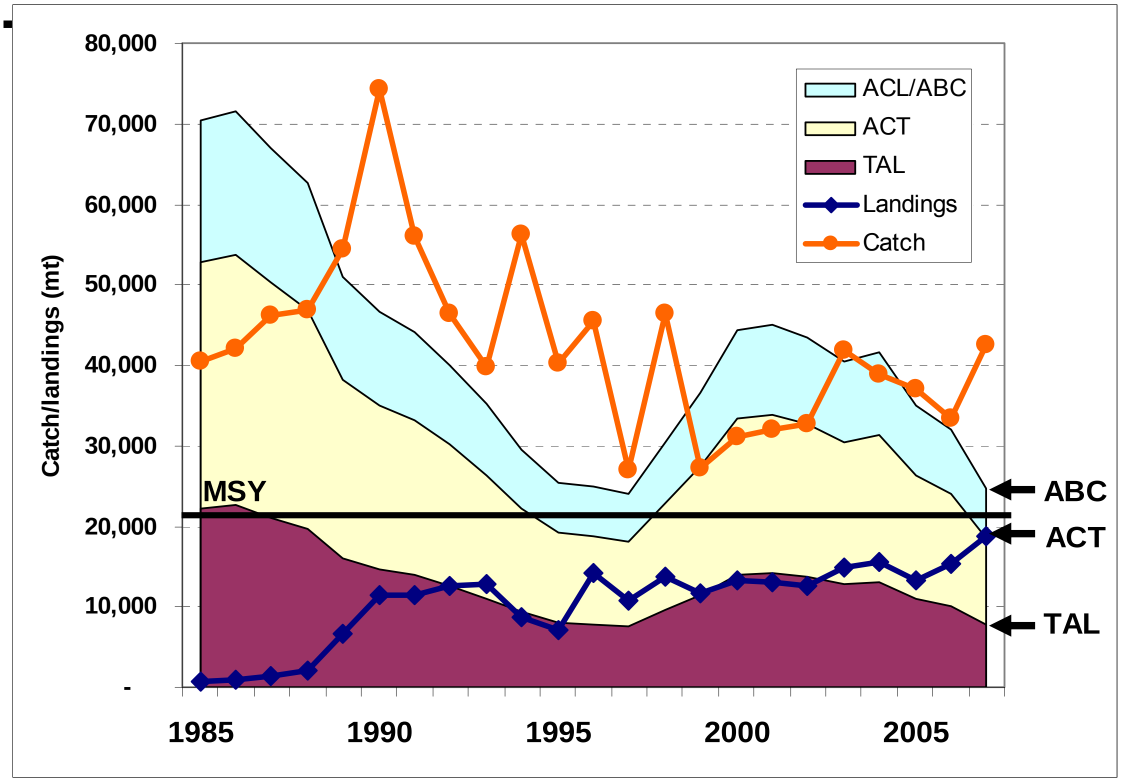


Table 31. Input variables and results application of catch/biomass ratios derived from length composition method catches and applied to stratified mean survey biomass.

	Catch/biomass index (thousand mt catch/kg per tow)		Stratified mean survey weight (kg/tow)		
Species	**Median**	**75% of median**	**2004-2006**	**2005-2007**	**Target**
Barndoor	4.32	3.24	1.17	1.00	1.62
Clearnose	2.25	1.69	0.59	0.63	0.56
Little	2.39	1.79	4.59	3.67	6.54
Rosette	1.18	1.36	0.06	0.06	0.03
Smooth	1.95	1.46	0.19	0.14	0.31
Thorny	2.96	2.22	0.55	0.42	4.41
Winter	4.12	3.09	3.04	2.93	6.46
Annual catch limit (ACL/ABC)			31,945	24,688	64,196
Annual catch target (ACT)			23,977	18,546	48,145
Total allowable landings (TAL)			10,067	7,786	20,213

Table 32. Calculation of alternative skate catch limits using catch and catch/biomass medians from the Data Poor Assessment Workshop selectivity ogive method.

	Catch		C/B derived catch limits	
Species	Median	80% of medi	Median	75% of medi
Barndoor	400	320	3,236	2,425
Clearnose	1,110	888	1,548	1,161
Little	10,189	8,151	5,230	3,917
Rosette	47	38	142	107
Smooth	303	242	243	183
Thorny	5,209	4,167	1,334	1,002
Winter	16,586	13,269	12,092	9,069
Total	33,844	27,075	23,825	17,864
Discards	19,962	15,969	14,052	10,536
Prohibited species	5,321	4,256	4,332	3,249
Legal species	14,641	11,713	9,720	7,287
Discard rate legal sp	52%	52%	51%	51%
Allowable landings	13,882	11,106	9,773	7,328
Prohibited species	591	473	481	361
Legal species	13,291	10,633	9,292	6,967
Wing fishery TAL	10,419	8,336	7,532	5,648
Change from 2007	-26%	-41%	-47%	-60%
Bait fishery TAL	3,463	2,770	2,241	1,679
Change from 2007	-27%	-42%	-53%	-65%
TAL	13,882	11,106	9,773	7,328
Discards	19,962	15,969	14,052	10,536
TAC	33,844	27,075	23,826	17,864
Change from 2007	-19%	-35%	-43%	-57%

Figure 64. Trend in annual ABC, ACT, and TALs derived from applying the median catch/biomass ratio from catches using the selectivity ogive method to assign catches and apply them to historic stratified mean biomass by skate species.

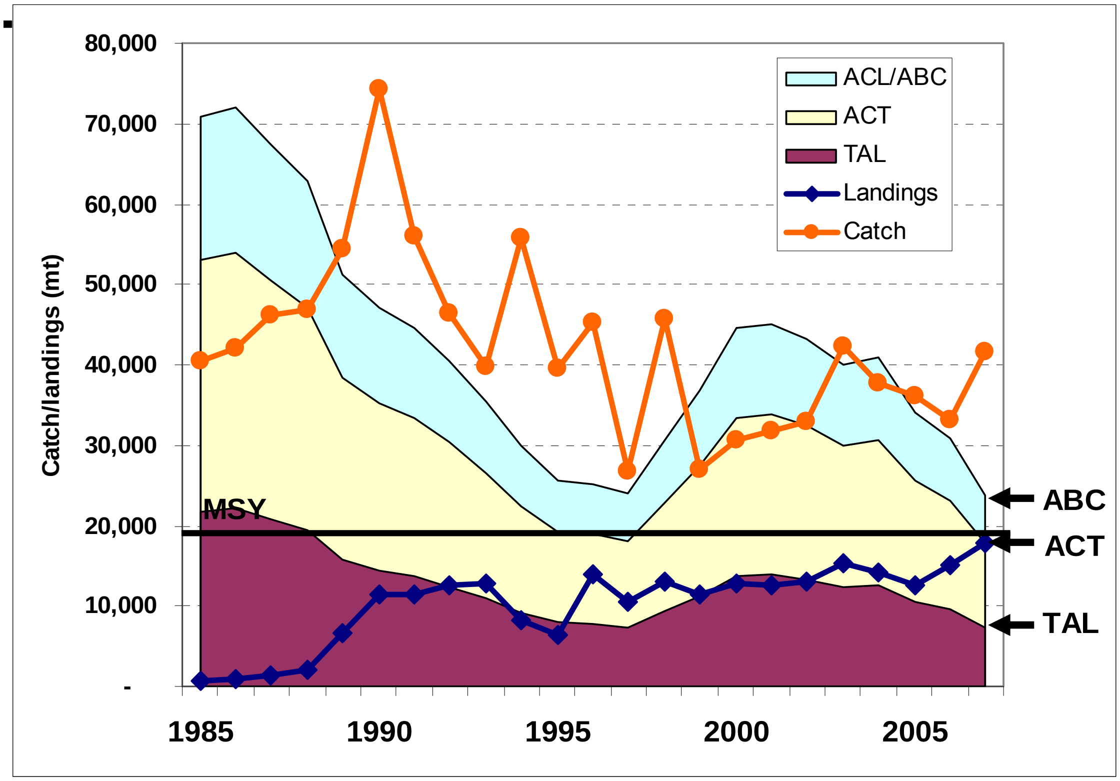


Table 33. Input variables and results application of catch/biomass ratios derived from selectivity ogive method catches and applied to stratified mean survey biomass.

Species	Catch/biomass index (thousand mt catch/kg per tow) Median	75% of median	Stratified mean survey weight (kg/tow) 2004-2006	2005-2007	Target
Barndoor	3.23	2.42	1.17	1.00	1.62
Clearnose	2.44	1.83	0.59	0.63	0.56
Little	2.39	1.79	4.59	3.67	6.54
Rosette	2.19	1.65	0.06	0.06	0.03
Smooth	1.69	1.27	0.19	0.14	0.31
Thorny	3.14	2.36	0.55	0.42	4.41
Winter	4.12	3.09	3.04	2.93	6.46
Annual catch limit (ACL/ABC)			30,898	23,826	63,240
Annual catch target (ACT)			23,162	17,864	47,462
Total allowable landings (TAL)			9,501	7,328	19,469

17. Document 17

ABC and Overfishing Definition Update Approval by SSC

New England Fishery Management Council
50 WATER STREET | NEWBURYPORT, MASSACHUSETTS 01950 | PHONE 978 465 0492 | FAX 978 465 3116
John Pappalardo, *Chairman* | Paul J. Howard, *Executive Director*

To: Paul J. Howard, Executive Director
From: Dr. Steve Cadrin, Chairman, Scientific and Statistical Committee
Date: February 11, 2009

Subject: **SSC Recommendations on Skate Amendment 3**

The SSC was asked to review updated Skate Acceptable Biological Catch (ABC) to be implemented through Amendment 3 to the FMP for the Northeast Skate Complex. ABCs are required under the Magnuson-Stevens Act and must be specified using best available science, taking into account uncertainty to prevent overfishing. In addition, the ABCs may be specified such that they have an acceptable probability of rebuilding overfished species.

On February 6 2009, the SSC reviewed the Council request, overview presentations by the skate PDT, and six background documents:

1. NEFSC 2009. Skate Species Complex: Examination of Potential Biological Reference Points for the Northeast Region. In The Northeast Data Poor Stocks Working Group Report, December 8-12, 2008 Meeting. NEFSC Ref. Doc. 09-02.
2. Miller, T., R. Muller, B. O'Boyle and A. Rosenberg. "Report by the Peer Review Panel for the Northeast Data Poor Stocks Working Group" 20 January 2009
3. "Discard estimation" (December 11, 2008 memo from A. Applegate to Data Poor Assessment Workshop)
4. "Estimated species composition of skate landings and discards using the selectivity ogive method" (January 14, 2009 memo from A. Applegate to Skate PDT)
5. "Skate rebuilding catch limit re-analysis" (January 14, 2009 memo from PDT to SSC)
6. "Skate ABC recommendations" (January 26, 2009 memo from Skate PDT to SSC)

Revised reference points and stock status

The Peer Review Panel of the Data Poor Stocks Working Group recommended maintaining index-based reference points in which B_{MSY} proxies are defined based on the 75th percentile of the survey time series, and $B_{threshold}$ is one-half B_{MSY}. The scientific basis of these reference points is that each of the seven skate species is assumed to have been at or near B_{MSY} during the survey series, and the upper range of the survey series approximates B_{MSY}. The Panel recommended using the entire survey series in the calculation of B_{MSY} proxies (except for barndoor skate), because there is no basis for excluding recent data. For barndoor skate, the Panel recommended that the existing definition (based on the 1963-1966 period) be maintained. The Panel also recommended maintaining existing overfishing definitions, which are based on annual percent declines of the survey index used to monitor stock biomass.

Application of the Peer Review Panel's recommended reference point values changes the status of some skate species (see Figure):

- Thorny skate is overfished and overfishing is occurring.
- Winter skate and smooth skate are approaching an overfished condition (i.e., their biomass index is near the minimum stock size threshold), but overfishing is not occurring.
- All other skates (little skate, barndoor skate, clearnose skate and rosette skate) are not overfished and overfishing is not occurring.

SSC Recommendation:

1. **The SSC endorses the minimum stock size thresholds, overfishing reference points, and resulting status determinations recommended by the Peer Review Panel of the Data Poor Stocks Working Group.**

    a. The SSC recognizes that MSY reference points could not be estimated because of uncertain catch data, imprecise survey series, and a general lack of correspondence between the magnitude of estimated fishery removals and trends in stock biomass.

    b. Endorsement of the Peer Review Panel's recommended revisions to skate reference points does not imply that reference points for the northeast skate complex (and the values of stock size thresholds) should be automatically updated when new survey data becomes available. The recommended B_{MSY} and F_{MSY} proxies are arbitrary, and continued revisions of the percentile-based B_{MSY} reference points would shift the value of the reference point in the direction of the stock's recent trend (i.e., continued decline would decrease the reference point, and rebuilding would increase the reference point). Any revision to these reference points should be recommended through a peer review process, and should be based on MSY or appropriate proxies.

<u>Acceptable Biological Catch</u>

The PDT presented several alternative methods for deriving Acceptable Biological Catch (ABC). The methodology for determining ABC was not reviewed by the Data Poor Stocks Working Group.

SSC Recommendation:

2. **The SSC recommends that Acceptable Biological Catch for the northeast skate complex is 23,826 mt per year for the 2010 and 2011 fishing years.**

    a. The ABC recommendation is derived as the multispecies skate catch associated with the median of the observed series of a catch/biomass exploitation index and the most recent 3-year average of the multispecies skate survey index.

    b. The SSC agreed with the PDTs proposed strategy of monitoring the status of individual skate species, managing the fishery using a multispecies catch limit, supplemented with additional management actions as needed. Therefore the ABC recommendation is for the entire Northeast skate complex.

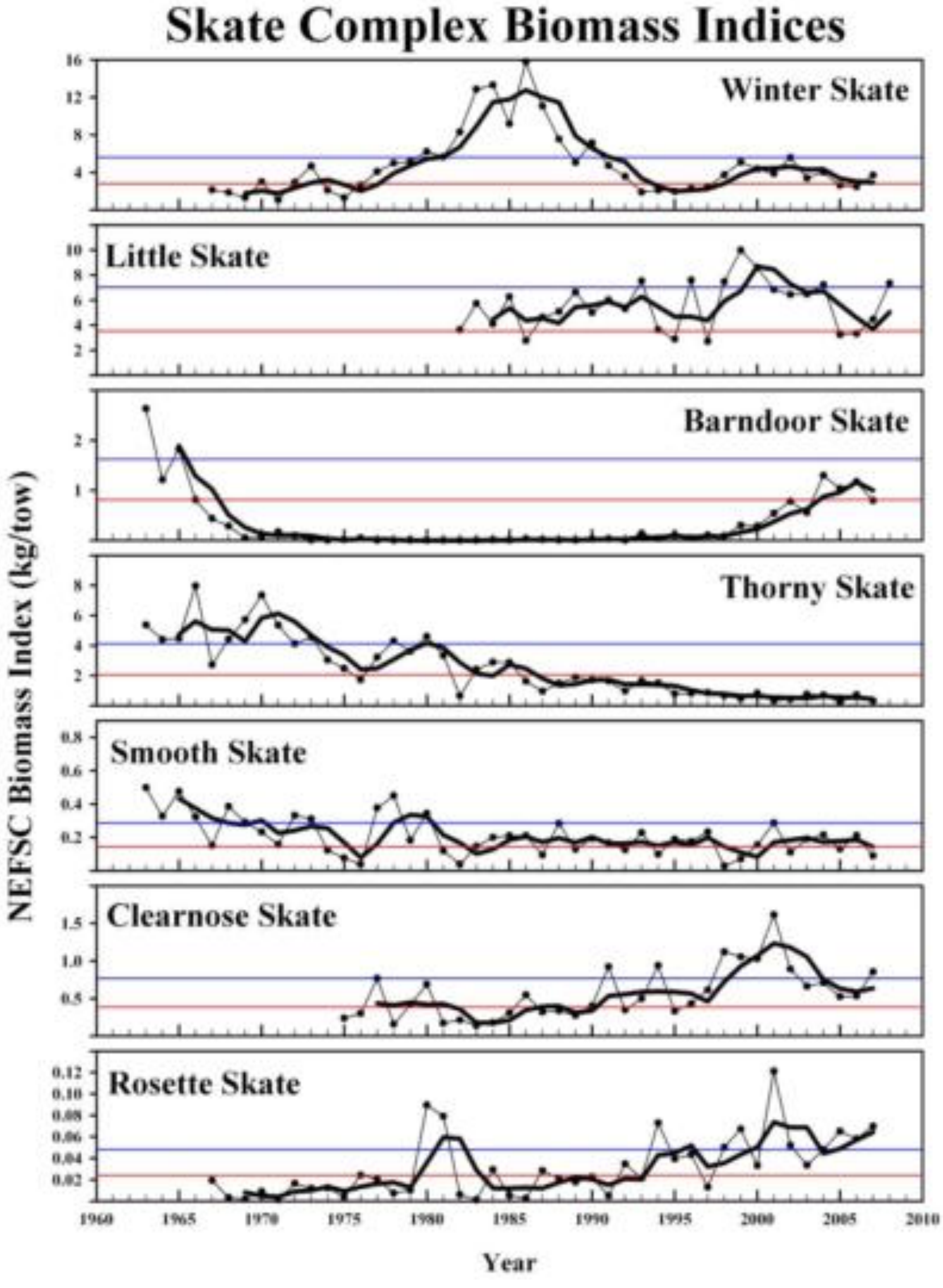
    c. The catch associated with overfishing (OFL: overfishing level), cannot be determined, because overfishing reference points are survey proxies, and estimates of fishing mortality or fishing mortality reference points are not available. Therefore, the method of determining ABC should be considered an interim proxy until an OFL and its uncertainty can be quantified, and supplemental management actions will continue to be required for individual skate species that are overfished or for which overfishing is occurring.

    d. Given that the survey series used to monitor stock biomass ended in 2008 (i.e., the R/V Albatross was replaced by the FSV Bigelow), the ABC recommendation should be maintained for 2010 and

2011 fishing years. The next framework adjustment should consider results from vessel calibration experiments to revise the ABC determination method.

e. The Annual Catch limit (ACL) cannot exceed the ABC. The recommended ABC (23,826 mt) is 57% of the estimated catch in 2007. Therefore total catch (the sum of landings and discards) must be reduced by at least 43%. The Council should account for the expected discard rate and management uncertainty to determine Total Allowable Landings (TAL).

Figure 1. Trends in stratified weight per tow compared to updated biomass reference points. The blue, upper line represents the B_{MSY} proxy. The red line represents the minimum stock size threshold (i.e., the stock is determined to be overfished when the three year moving average for biomass is below this threshold).



18. Document 18

Discard estimation analysis

New England Fishery Management Council
50 WATER STREET | NEWBURYPORT, MASSACHUSETTS 01950 | PHONE 978 465 0492 | FAX 978 465 3116
John Pappalardo, *Chairman* | Paul J. Howard, *Executive Director*

MEMORANDUM

DATE: **December 11, 2008**

TO: Data Poor Assessment Workshop

FROM: Andrew Applegate

SUBJECT: **Discard estimation**

During the Data Poor Assessment Workshop (DPWS), new skate discard estimates were presented which differed substantially (see Figure 1) from those estimated during SAW44 and updated by the Skate PDT during the development of Amendment 3. Most of the differences were thought to be associated with filling unmatched trips with average DK (live weight ratio of observed discarded skates to the observed kept of all species). Like the SAW44 estimate, a three level stratification was applied to observed trips and dealer landings (obtained from the area allocation "AA" tables). The stratification included gear (longline, limited access scallop dredge, general category scallop dredge, shrimp trawl, sink gillnet, and fish trawl), region (Gulf of Maine, Georges Bank, Southern New England, Mid-Atlantic) and quarter (1-4).

The new estimates had the same trend as the previous ones through 2002, but differed substantially from 2003 to 2006 (Figure 1). Most filled DK rations, however, were concentrated in earlier years (Figures 4-7), the largest difference arising from longline gear in 1991 and 1992 and trawl gear in 1998. The cause of the differences for 2003-2006 were not apparent. These more recent discard estimates are critically important because the Council uses the last three years of the discard time series (2004-2006) to reduce the allowable catch limits and set landings targets. Based on the earlier estimates, it was believed that discards had declined substantially due to regulatory effects. The new estimated discards do not show this decline.

To explore the source of these important differences the sea sampling and dealer data were analyzed independently using a different stratification schema to potentially reduce the effects of oversampling of the US/CA area, access area, and special access program trips which are distributed in special areas. Also mesh categories were also introduced to account for DK differences that might be caused by small (< 5.5 inches), large (5.5 to 8 inches), and very large mesh (> 8 inches) for trawl and sink gillnets. A seasonal stratification was also applied (fall 07-10, spring 03-06, and winter 11-02) to comport with the three annual finfish NMFS trawl surveys so that the aggregate discard estimates could be allocated by species. A four level stratification was applied to both data sets: gear (longline, scallop dredge, scallop trawl, sink gillnet, fish trawl, shrimp trawl, and other), sub-region (Delmarva, E. Georges Bank, E. Gulf of Maine, NY Bight, Offshore, S. Channel, Southern New England, and Other), season (see above), and mesh (see above). Dealer data that matched observed DK ratios from observed trips accounted for about 65-75% of total landings. Where DK matches did not exist, the DK ratio for a two level stratification (gear and sub-region) was applied. Together, the combined matches accounted for 95-99% of total landings. The remaining unmatched trips were for combinations that generally seemed to be associated with low skate discards and the DK ratios were assumed to be zero. No general linear modeling was applied (see analysis below for further discussion) at the time of these discard estimates.

Similar to the NEFSC estimates, the ratio of sums (DK) were applied to total live weight landings of all species on the dealer reports. A simplified method was also applied which discards are the multiplicative product of the observed skate discards per trip times the number of trips landed by dealers. For both, discard 95% confidence levels were computed by bootstrapping the trips (10% of trips in 100 iterations) to obtain a standard deviation for the DK mean by gear. The discard estimates in each 'cell' were then calculated over 1000 iterations with a log normal distribution on DK with a mean μ and a standard deviation σ.

The alternative discard estimates (Figure 2) tend to agree reasonably well with the NEFSC estimates since 1999, and particularly well for estimates since 2003. Before 1998, the discard estimates diverge due to low sample size, but generally all estimates show a declining trend from 1996-1999.

These discard estimates did not however reveal the source of the error in the SAW44 discard estimates. Further exploration of the discard rates was conducted to try to understand why skate discards do not appear to be declining despite more restrictive groundfish regulations during the recent period. For vessels using trawls, skate discards per haul, trip, and kept landings increased from 2000 to 2008 (Figure 9). A similar pattern was observed for vessels using sink gillnets (Figure 10). Observed skate discard rates declined for vessels using scallop dredges (Figure 11). In all three cases, the trends could be caused by oversampling trips in special access programs that could have skate discard rates that differ from regular trips.

Skate discards for vessels landing more than 1000 lbs. of skates (live weight) also increased since 2001 (Figure 12), but appear to level off since 2005 and possible decline in 2008 (a partial year). Skate discard rates for vessels fishing in the Gulf of Maine (Figure 14) and the Mid-Atlantic (Figure 16) appeared to vary without trend (Figure 13) at very low levels particularly since 1999, either per trip or per lb. kept. There appears to be a moderate upward trend in discards in Southern New England (Figure 15) since 2000. Skate discard rates on Georges Bank appear to have trended upward since 2001 (Figure 14), mimicking the overall trend.

When broken out by management program, skate discard rates for regular trawl trips in the Georges Bank region varied without trend from 1989 to 2000, then increased in 2001 and varied at a higher level since that time. In the more recent period, discards averaged 0.3 to 0.6 lbs. of skates per pound kept. In contrast, skate discards on oversampled US/CA area trips were much higher, averaging 0.6 to 0.8 lbs. of skate discards per pound kept.

During the comparison of the discard estimates during the DPWS, it was determined that the SAW44 estimates did not include the US/CA area, scallop access area, and groundfish special access program observed trips. It seems plausible that this omission may have contributed to the estimated declining trend in skate discards that was previously estimated. On the other hand, the high skate discard rates in the US/CA trips may also in some cases be inappropriately applied to non-US/CA area trips, but there is no field in the dealer data to determine trip type. Some post-stratification of DK rates and dealer landings by sub-region and time could reduce this undue influence on the discard estimation.

Also during the DPWS, it was suggested that a General Linear Model (GLM) analysis should be conducted to determine which type of stratification of observed trips would be better a better model to follow. All three stratifications were analyzed via GLM, plus the NEFSC stratification with only regular management program trips (excluding US/CA area, scallop access area, Multispecies Category B DAS, and special access program trips). All models were significant and one stratification wasn't clearly superior to the other, except that simpler models (i.e. less independent variables) explained a significant amount of the DK variance, but all models had relatively low predictive capability (low R).

More detailed information about the GLM analyses are shown in Tables 2-5. For model 1 (Table 2), the MSE for all independent variables except quarter were significant. Holding the effects of the other independent variables constant, the least squares means increased from 2001 to 2007. Trawl DK rates were substantially higher than other gears and higher in the Southern New England region than the others. Similar trends were observed for a GLM applied to only regular management program observed trips (Table 3).

For model 3 (Table 4), which was applied to unmatched trips in this analysis, all independent variables (year, gear, sub-region) were significant and explained a significant fraction of the DK variation. DK trends for year and gear were similar to those for models 1 and 2. DK rates were high for the E. Georges Bank, NY Bight, and Southern New England sub-regions. All independent variables in model 4 (which was used in this analysis to estimate discards on matched trips) were significant (Table 5), except for season which was retained to comport with the survey data to be used to allocate aggregate discards to species. Holding the effects of the other independent variables constant, the least squares means showed a similar trend for year, but the discard rate for trawls was lower than the other model formulations which did not use mesh as an independent variable. Somewhat counter intuitively, the DK rate was highest for large mesh trawls and gillnets, and lowest for small mesh trawls and gillnets. This may be related to the lower amount of kept for other species compared to the discard of skates for vessels using large mesh. It also suggests that vessels using mesh larger than 8 inches may have a lower skate discard rate – or simply catch more of the target species relative to the amount of skates discarded.

Figure 66. Comparison of new NEFSC discard estimates with SAW44/PDT discard estimates.

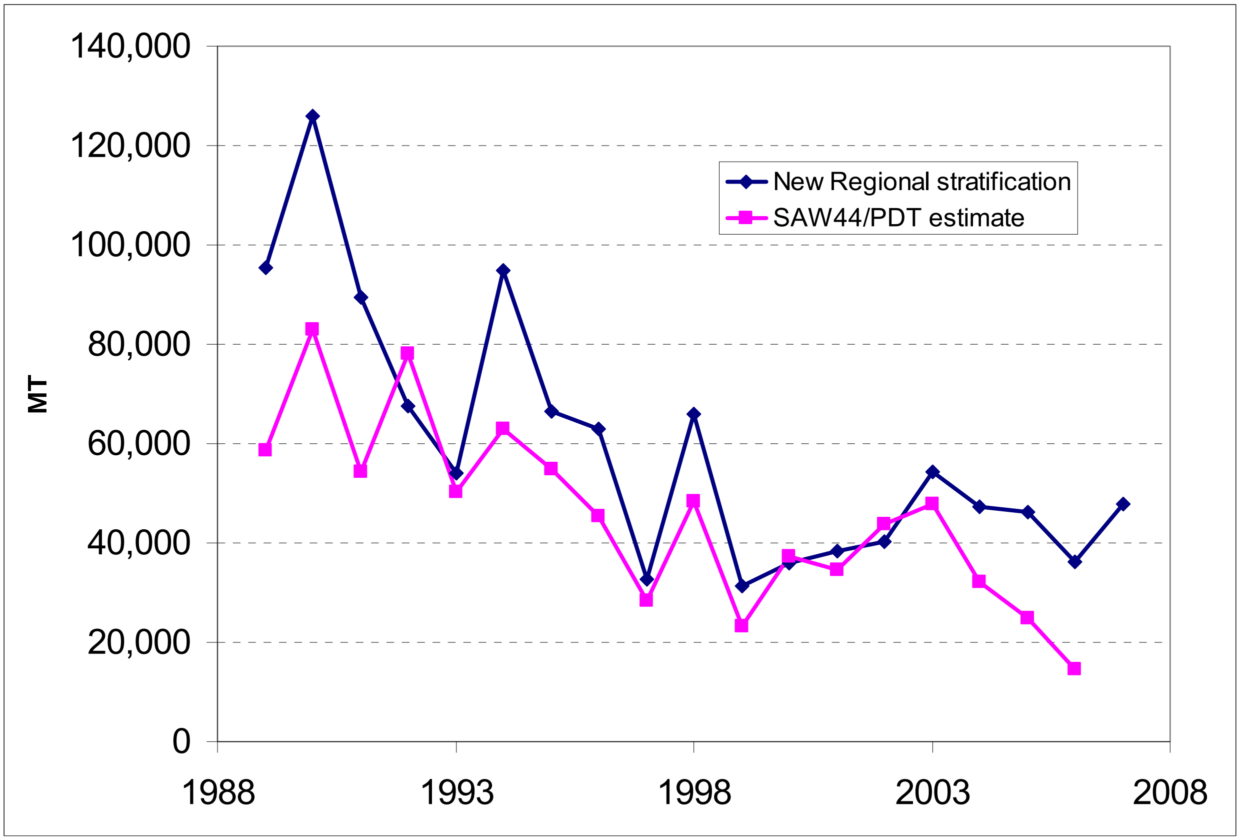


Figure 67. Comparison of discard estimates, including one using a simplified method and a re-stratification at the subregion level (gear, sub-region, season, mesh).

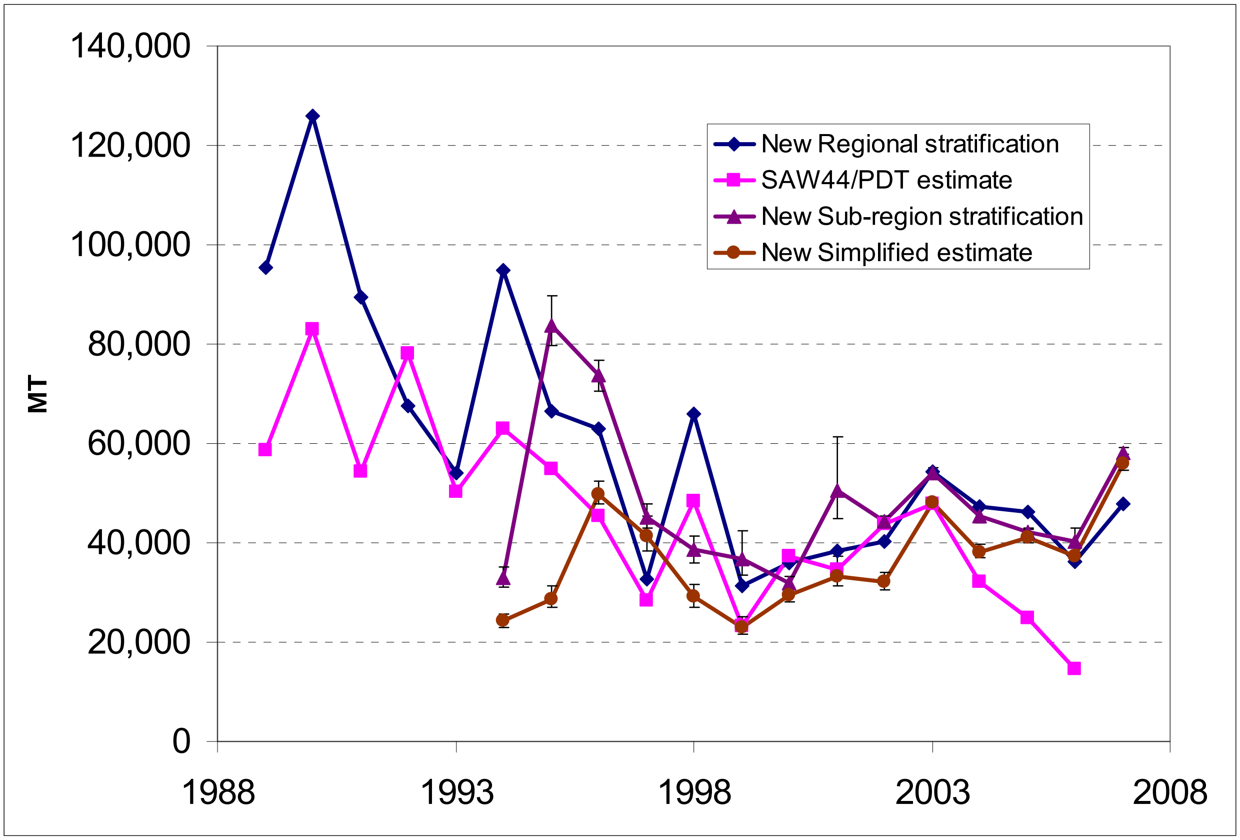


Figure 68. Match trips and all fill types: Estimated discards by gear type via the new NEFSC skate discard estimation.

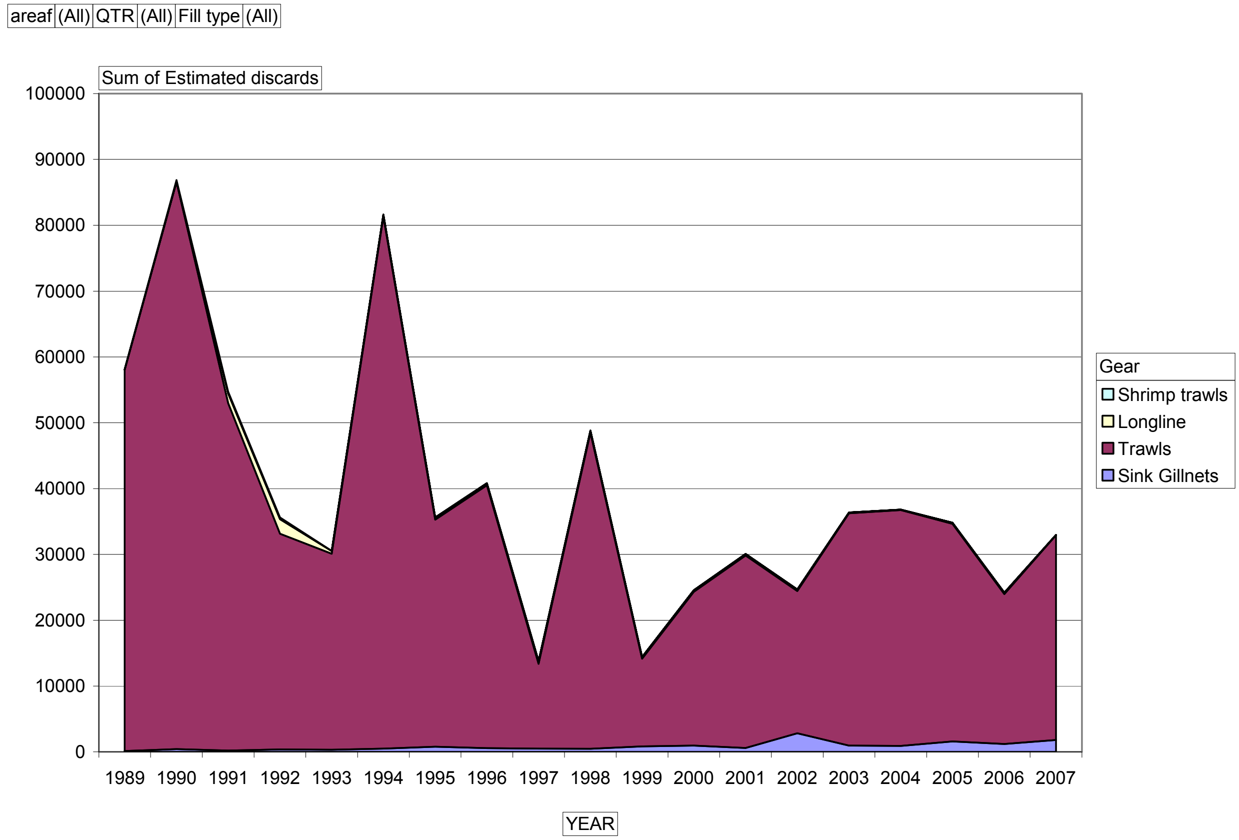


Figure 69. Mean within area fill: Estimated discards by gear type via the new NEFSC skate discard estimation.

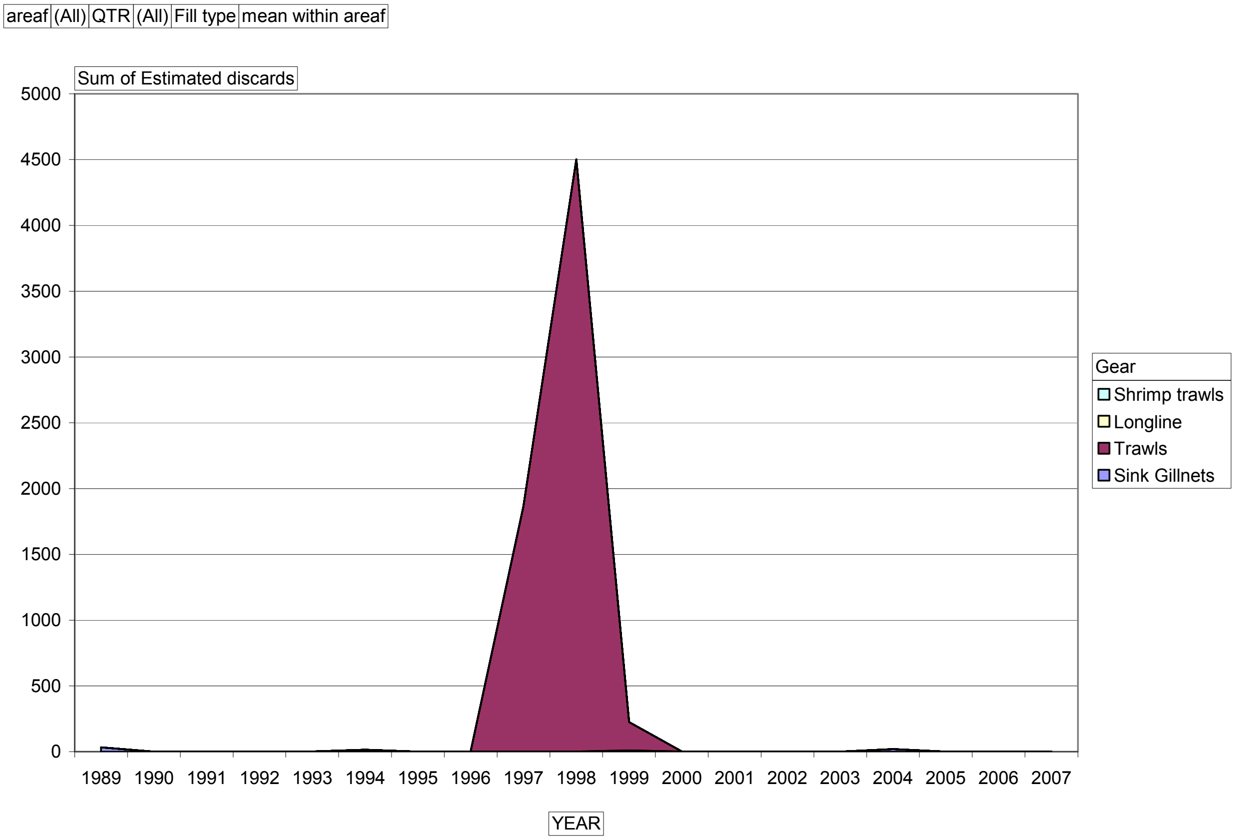


Figure 70. Mean within region fill: Estimated discards by gear type via the new NEFSC skate discard estimation.

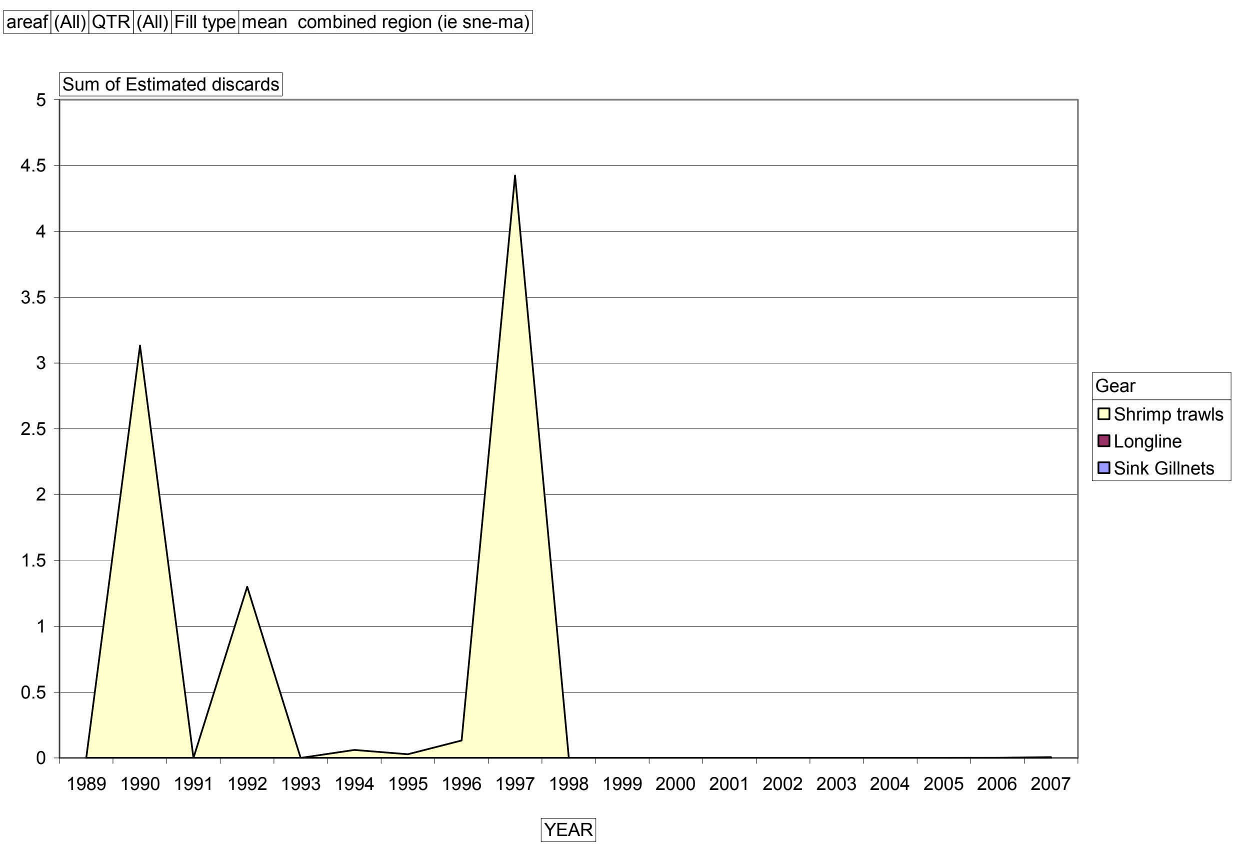


Figure 71. Mean within year fill: Estimated discards by gear type via the new NEFSC skate discard estimation.

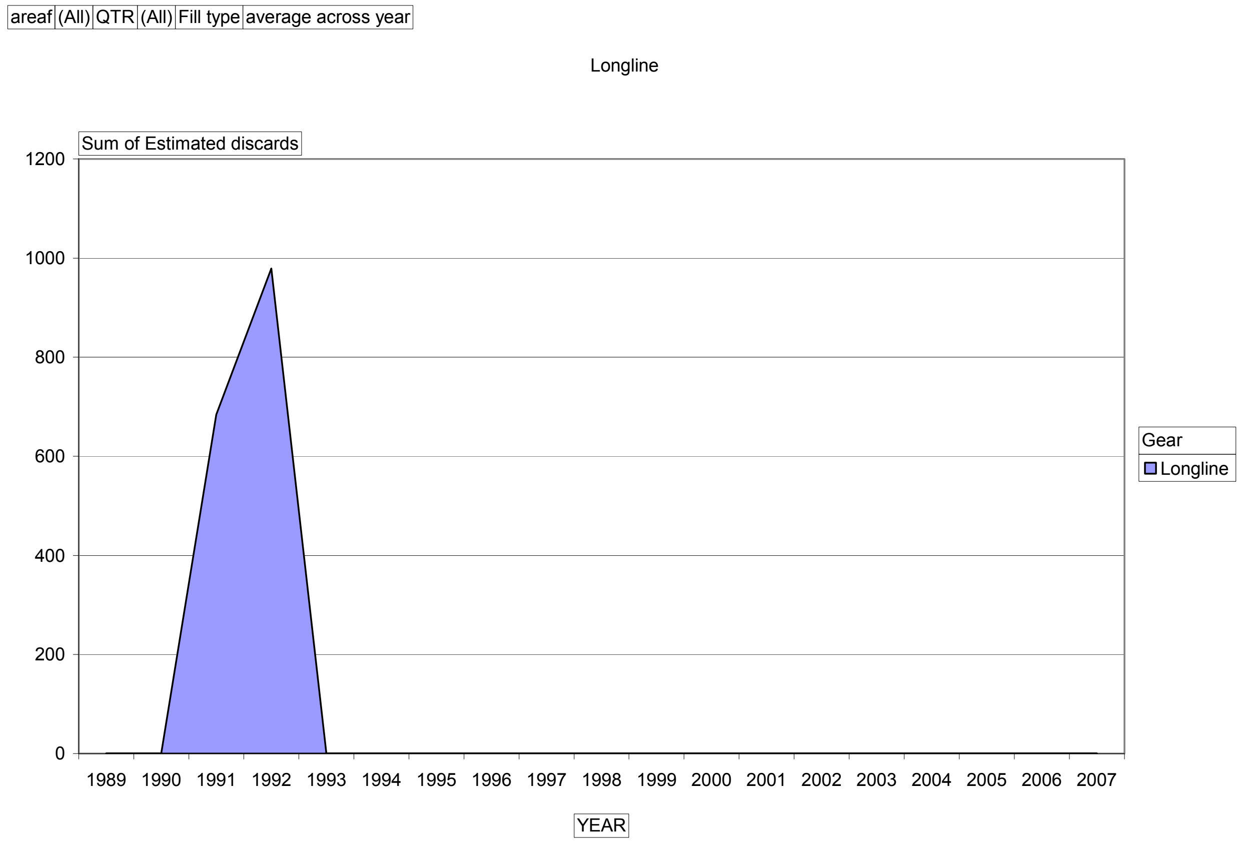


Figure 72. Mean for gear fill: Estimated discards by gear type via the new NEFSC skate discard estimation.

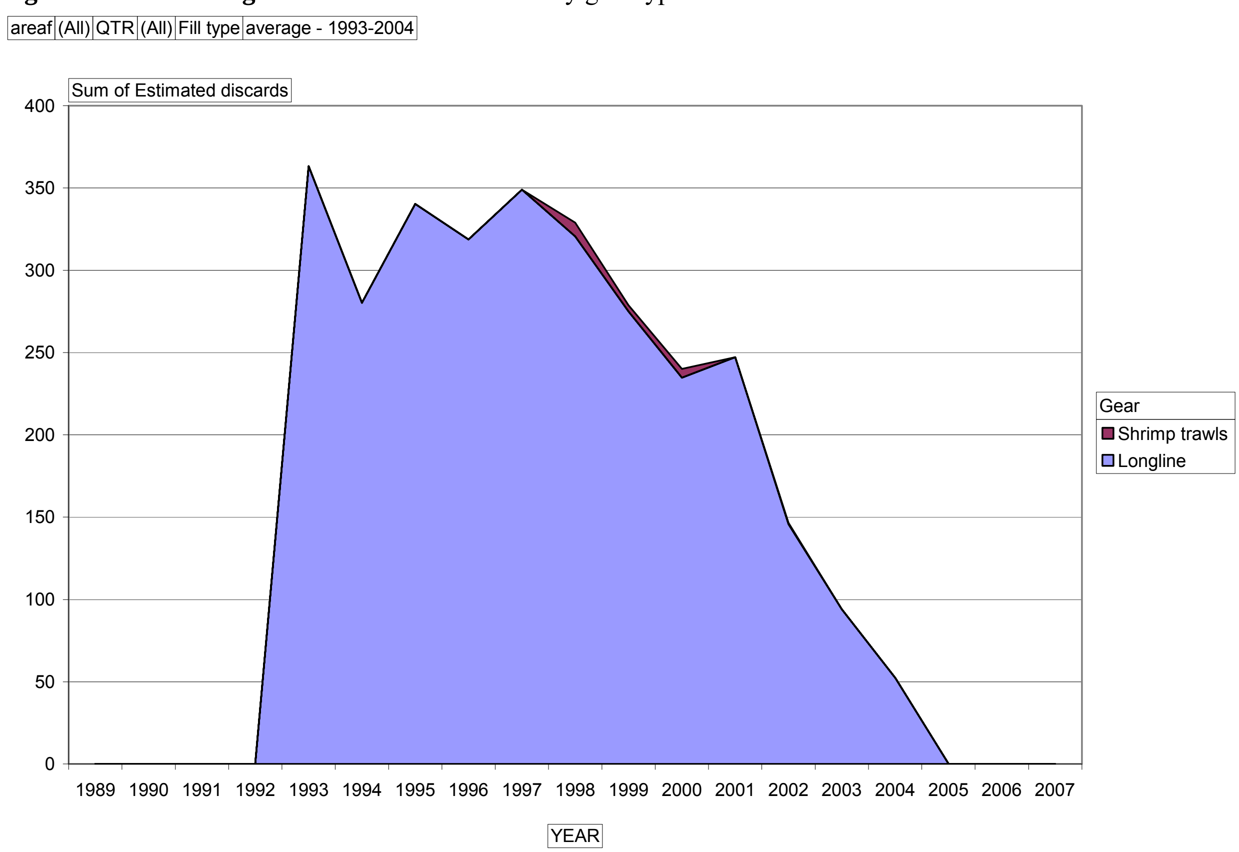


Figure 73. Observed D/K ratios by stratum, NEFSC estimation.

Fill type	None

Average of dkratio		Gear	areaf																	
		Longline				Scallop dredges				Shrimp trawls		Sink Gillnets				Trawls				Grand Total
YEAR	QTR	GBK	GOM	MA	SNE	GBK	GOM	MA	SNE	GBK	GOM	GBK	GOM	MA	SNE	GBK	GOM	MA	SNE	
1989	1									0.000	0.020				0.000	0.802	0.346	0.213	1.688	0.438
	2										0.042	0.003			0.000	0.272	0.166	0.024	0.297	0.115
	3											0.005	0.003		0.000	0.286	0.128	0.510	1.136	0.295
	4										0.018	0.018	0.008		0.000	0.386	0.194	0.145	0.569	0.167
1990	1										0.050	0.014	0.107			1.037	0.246	0.144	2.583	0.597
	2										0.011	0.013	0.047	0.000		0.335	0.130	0.103	0.081	0.090
	3											0.000	0.003			0.125	0.028	0.384	0.131	0.112
	4										0.114	0.002	0.009	0.000	0.000	0.281	0.280	0.426	1.825	0.326
1991	1	0.774								0.289	0.069	0.005	0.041	0.000		0.345	0.123	0.009	0.706	0.236
	2										0.038	0.007	0.014	0.000		0.399	0.042	0.444	0.451	0.174
	3											0.019	0.008		0.000	0.075	0.083	1.595	0.363	0.306
	4	0.174	0.041								0.129	0.045	0.007		0.000	0.516	0.086	0.209	0.257	0.147
1992	1	0.906	0.110								0.078	0.053	0.104	0.000	0.016	0.474	0.102	0.109	0.027	0.180
	2	0.222		0.000							0.000	0.013	0.017		0.053	0.100	0.014	0.020	0.395	0.083
	3											0.002	0.003		0.067	0.029	0.024	0.212	0.231	0.081
	4										0.001	0.039	0.005		0.018	0.170	0.048	0.609	0.591	0.185
1993	1		0.088	0.000						0.000	0.018	0.017	0.050	0.000	0.044	0.116	0.146	0.024	0.060	0.047
	2			0.068								0.005	0.017		0.041	0.257	0.053	0.045	0.645	0.141
	3			0.000								0.002	0.002	0.000	0.170	0.020	0.025	0.047	0.866	0.126
	4										0.003	0.020	0.004	0.002	0.011	0.748	0.079	0.444	0.258	0.174
1994	1	0.000		0.000							0.005	0.007	0.103	0.007	0.014	0.204	0.030	0.099	0.004	0.043
	2											0.000	0.003	0.003	0.069	0.466	0.070	5.436	2.257	1.038
	3											0.000	0.001	0.001		0.239	0.071	0.048	0.071	0.061
	4										0.001	0.016	0.013	0.013	0.084	0.892	0.026	0.134	0.321	0.166
1995	1										0.002	0.031	0.097	0.014	0.077	0.415	0.048	0.632	0.101	0.157
	2											0.003	0.018	0.010	0.063	0.758	0.035	0.302	0.489	0.210
	3											0.003	0.003	0.004	0.114	0.120	0.011	0.106	0.107	0.058
	4										0.000	0.013	0.050	0.013	0.014	0.235	0.031	0.553	0.137	0.116
1996	1										0.004	0.035	0.216	0.016	0.004	0.615	0.033	0.225	0.132	0.142
	2										0.000	0.002	0.017	0.010	0.013	0.322	0.048	0.036	0.303	0.083
	3											0.008	0.004	0.007	0.000		0.000	0.004	2.012	0.291
	4										0.005	0.011	0.001	0.008	0.014	0.081	0.035	0.074	1.442	0.186
1997	1									0.001	0.006	0.005	0.048	0.019	0.002	0.241	0.128	0.079	0.125	0.065
	2											0.008	0.012	0.046	0.000		0.011		0.058	0.023
	3											0.001	0.000	0.000	0.030	0.145	0.004	0.003	0.531	0.089
	4											0.008	0.002	0.009	0.021	0.270		0.016	0.041	0.052
1998	1											0.022	0.021	0.008	0.002	0.169	0.092	0.051	0.072	0.055
	2											0.002	0.003	0.025	0.006		0.023	1.984	0.183	0.318
	3			0.087								0.022	0.001	0.028		0.148	0.579	0.113	0.064	0.130
	4											0.004	0.007	0.017	0.016	1.149		0.116	0.185	0.213
1999	1											0.090	0.008	0.021	0.014	0.004		0.010	0.006	0.022
	2											0.003	0.015	0.079	0.013	0.370	0.020	0.139	0.008	0.081
	3											0.003	0.003	0.000		0.405	0.042	0.009		0.077
	4											0.004	0.037	0.015	0.058	0.421	0.007	0.112	0.101	0.094
2000	1											0.016	0.015	0.000	0.023	0.123	0.151	0.039	0.094	0.057
	2											0.038	0.032	0.005	0.032	0.294	0.108	0.123	0.153	0.098
	3											0.486	0.007	0.000		0.197	0.016	0.011	0.186	0.129
	4											0.096	0.012	0.009	0.012	0.543	0.053	0.446	0.466	0.204
2001	1										0.000	0.058	0.020	0.004	0.000	1.129	0.062	0.004	0.041	0.146
	2											0.018	0.056	0.006	0.183	0.144	0.056	0.071	0.323	0.107
	3											0.009	0.011	0.000	0.000	0.164	0.064	0.014	0.114	0.047
	4											0.078	0.010	0.005	0.016	0.308	0.037	0.062	0.217	0.092
2002	1											0.033	0.002	0.029	0.035	0.459	0.031	0.065	0.000	0.082
	2											0.119	0.016	0.015	0.045	0.422	0.092	0.080	0.045	0.104
	3	0.212										0.022	0.052	0.000	0.021	0.309	0.072	0.058	0.081	0.092
	4	0.033	0.000		0.456							0.030	0.013	0.003	1.702	0.289	0.095	0.216	0.333	0.288
2003	1	0.155	0.057			0.018	0.042	0.073	0.008		0.009	0.286	0.029	0.025	0.069	0.576	0.077	0.186	0.716	0.150
	2					0.156		0.114				0.019	0.018	0.004	0.046	0.315	0.080	0.160	0.035	0.096
	3					0.099		0.217				0.036	0.011	0.000	0.055	0.472	0.085	0.005	2.266	0.315
	4	0.000				0.108		0.043	0.396			0.021	0.008	0.024	0.103	0.451	0.057	0.105	0.348	0.130
2004	1	0.013	0.011			0.045	0.003	0.062			0.004	0.064	0.026	0.000	0.036	0.446	0.049	0.064	0.111	0.067
	2							0.067				0.022	0.018	0.000	0.044	0.568	0.119	0.079	0.173	0.116
	3	0.035						0.083				0.046	0.009		0.025	0.620	0.042	0.023	0.729	0.169
	4	0.008		0.000	0.000	0.056	0.139	0.074	0.383			0.069	0.021	0.049	0.053	0.562	0.119	0.044	0.865	0.164
2005	1	0.093	0.052		0.000	0.025	0.051	0.147	0.263		0.003	0.767	0.051	0.025	0.059	0.538	0.059	0.045	0.168	0.140
	2	0.289	0.024			0.035		0.065				0.007	0.034	0.104	0.089	0.571	0.060	0.327	0.951	0.190
	3	0.105	0.012			0.039		0.082	0.397			0.045	0.009	0.038	0.106	0.718	0.067	0.155	0.627	0.168
	4	0.034	0.001	0.000	0.000	0.032		0.110	0.334			0.117	0.007	0.052	0.061	0.682	0.174	0.110	0.649	0.147
2006	1	0.498	0.040		0.008	0.041		0.076			0.000	0.023	0.050	0.035	0.067	0.717	0.106	0.034	0.174	0.130
	2	0.234		0.000		0.013						0.229	0.030	0.086	0.330	0.451	0.178	0.036	0.071	0.139
	3	0.000	0.000		0.000	0.048		0.140	0.152			0.058	0.008	0.003	0.126	0.730	0.079	0.021	0.274	0.114
	4	0.054	0.039	0.000	0.001	0.069		0.251	0.339		0.001	0.100	0.006	0.022	0.002	0.715	0.077	0.079	0.231	0.128
2007	1	0.376	0.093			0.036		0.106	0.794		0.000	0.622	0.018	0.025	0.119	0.680	0.153	0.109	0.178	0.216
	2	0.046	0.034			0.015	0.047	0.052	0.125			0.033	0.019	0.117	0.075	0.556	0.062	0.547	0.415	0.138
	3	0.081	0.091	0.000		0.031		0.068				0.069	0.013	0.013	0.040	1.062	0.031	0.050	0.479	0.142
	4	0.051	0.005	0.000	0.000	0.228	0.106	0.086	1.178			0.083	0.011	0.019	0.419	0.645	0.081	0.213	0.382	0.263
Grand Total		0.183	0.041	0.013	0.058	0.059	0.065	0.102	0.456	0.073	0.022	0.057	0.024	0.017	0.075	0.423	0.086	0.261	0.451	0.160

Figure 74. Observed skate discard rate for vessels using trawls.

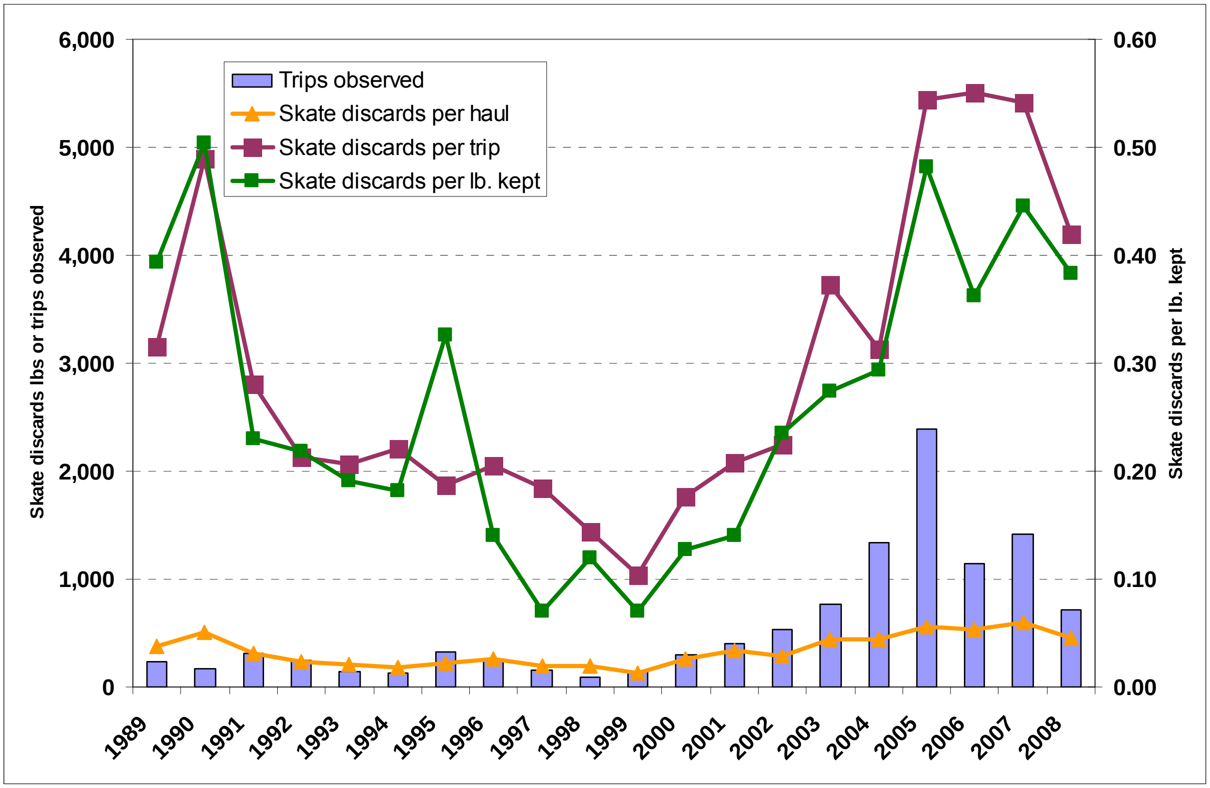


Figure 75. Observed skate discard rate for vessels using sink gillnets.

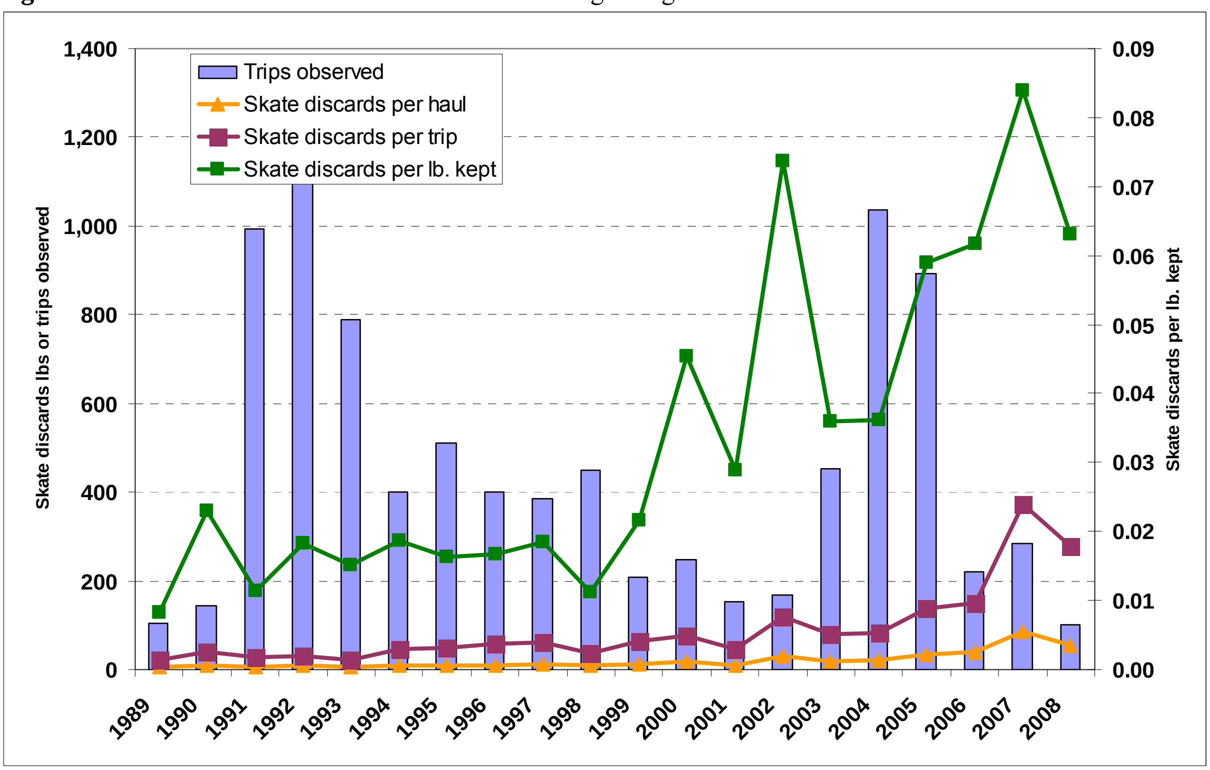


Figure 76. Observed skate discard rate for vessels using scallop dredges.

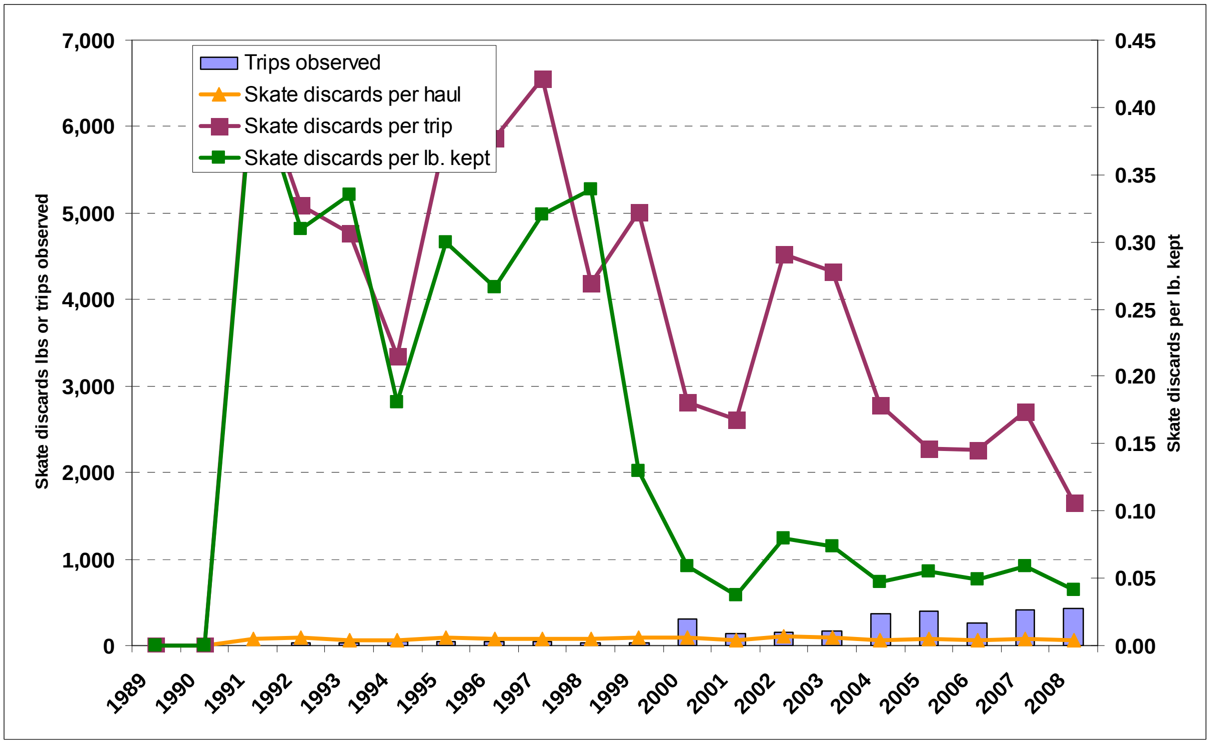


Figure 77. Observed skate discard rate for vessels landing > 1000 lbs. of skate, live weight.

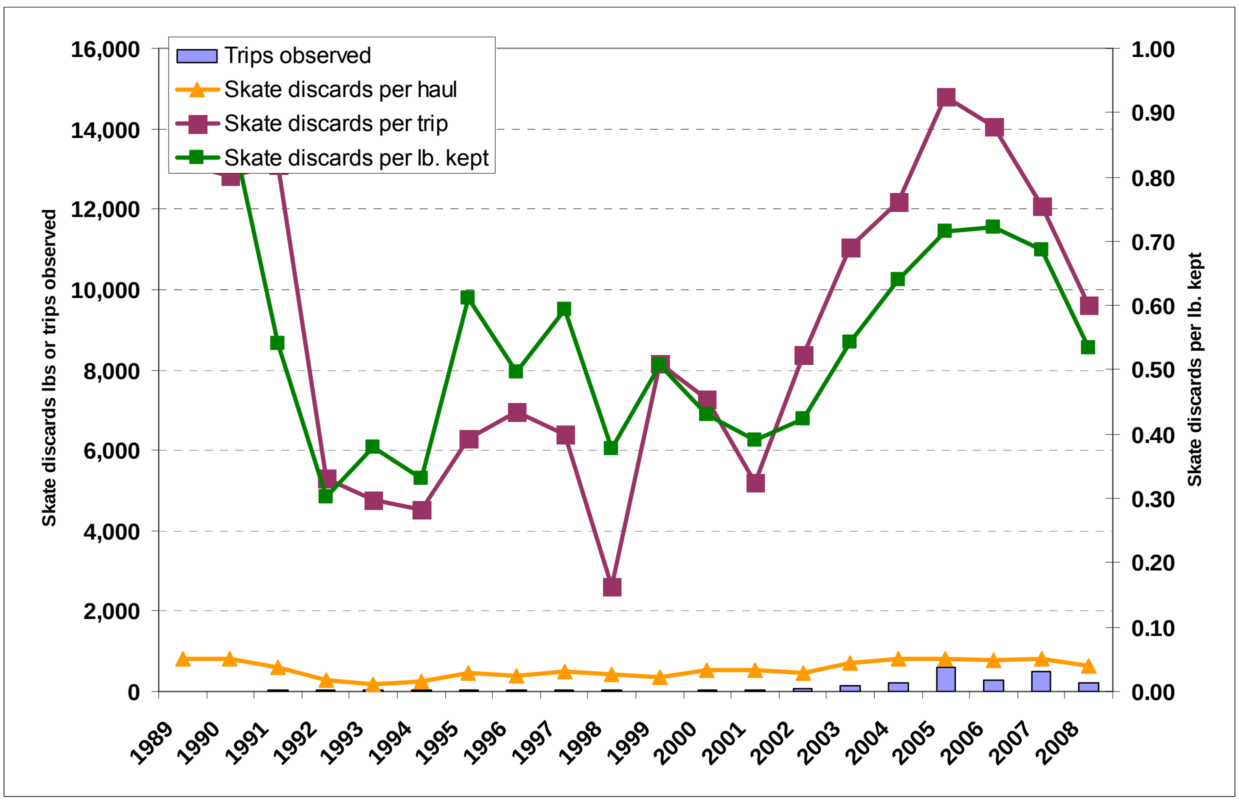


Figure 78. Observed skate discard rate for vessels fishing in the Gulf of Maine.

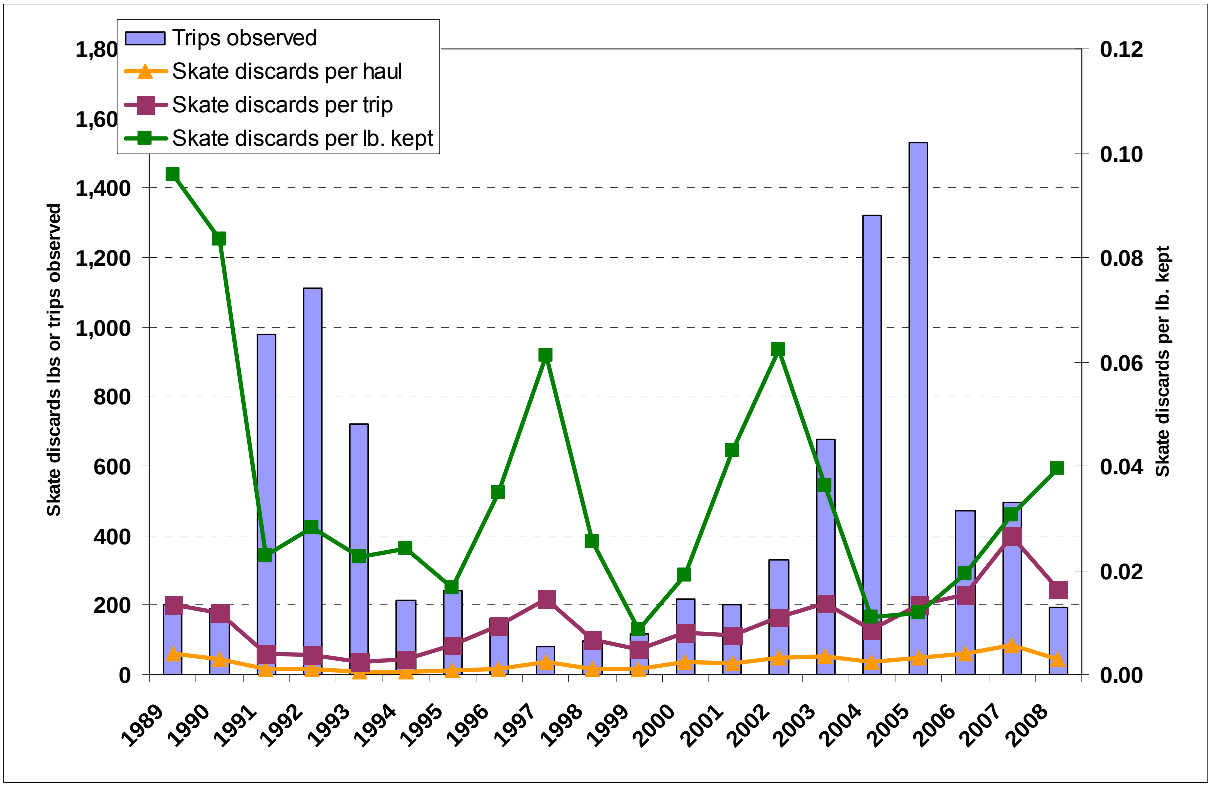


Figure 79. Observed skate discard rate for vessels fishing on Georges Bank.

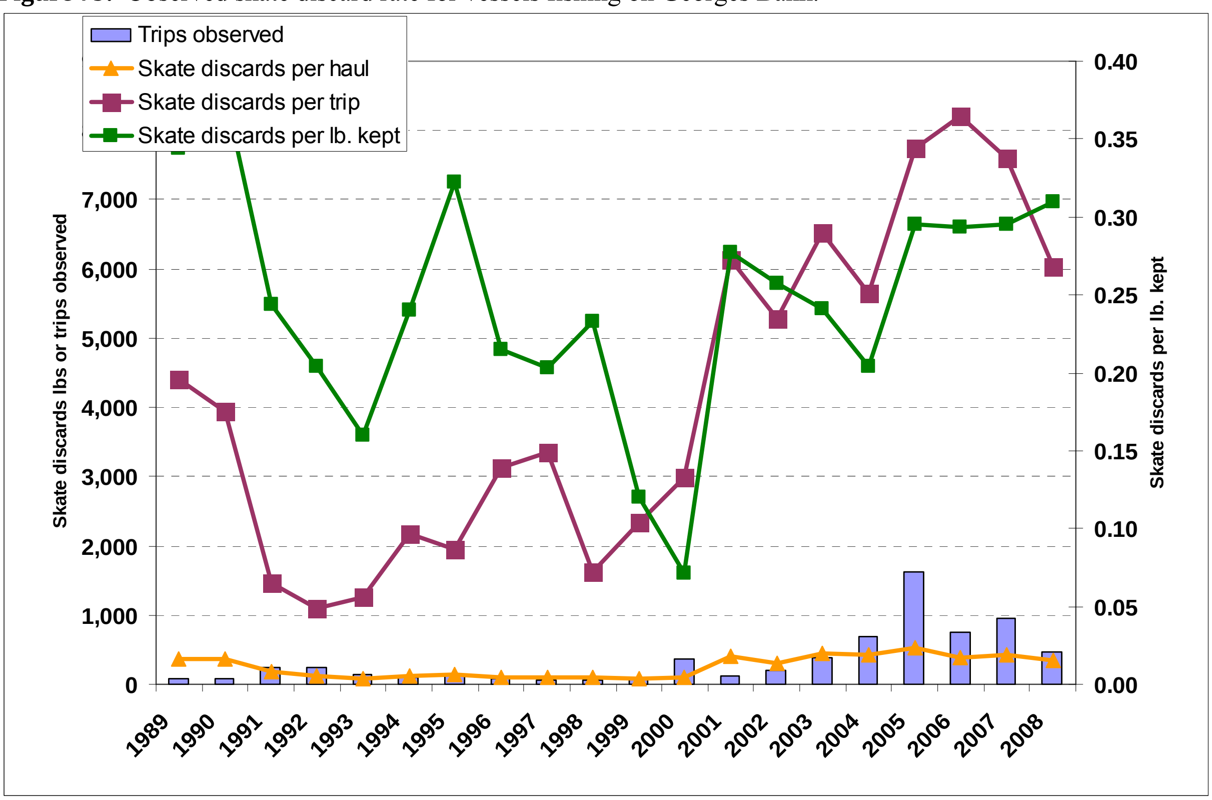


Figure 80. Observed skate discard rate for vessels fishing in Southern New England.

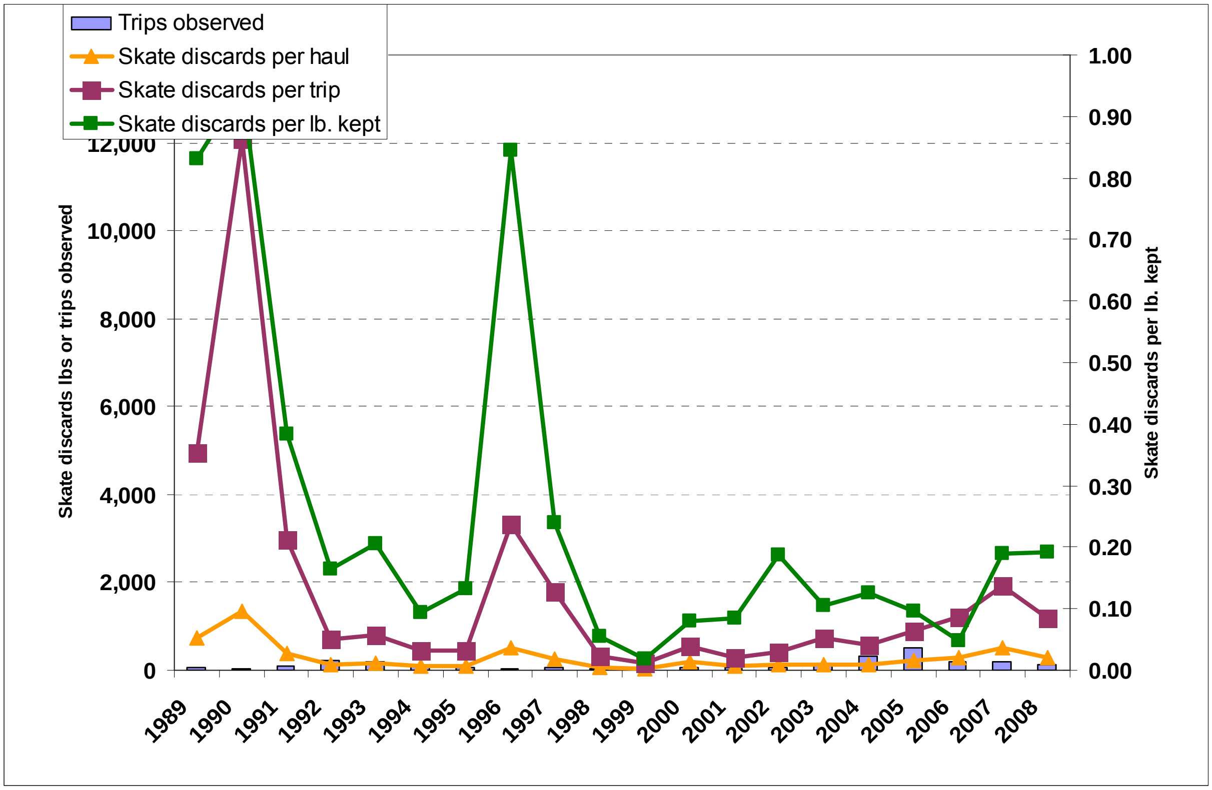


Figure 81. Observed skate discard rate for vessels fishing in the Mid-Atlantic.

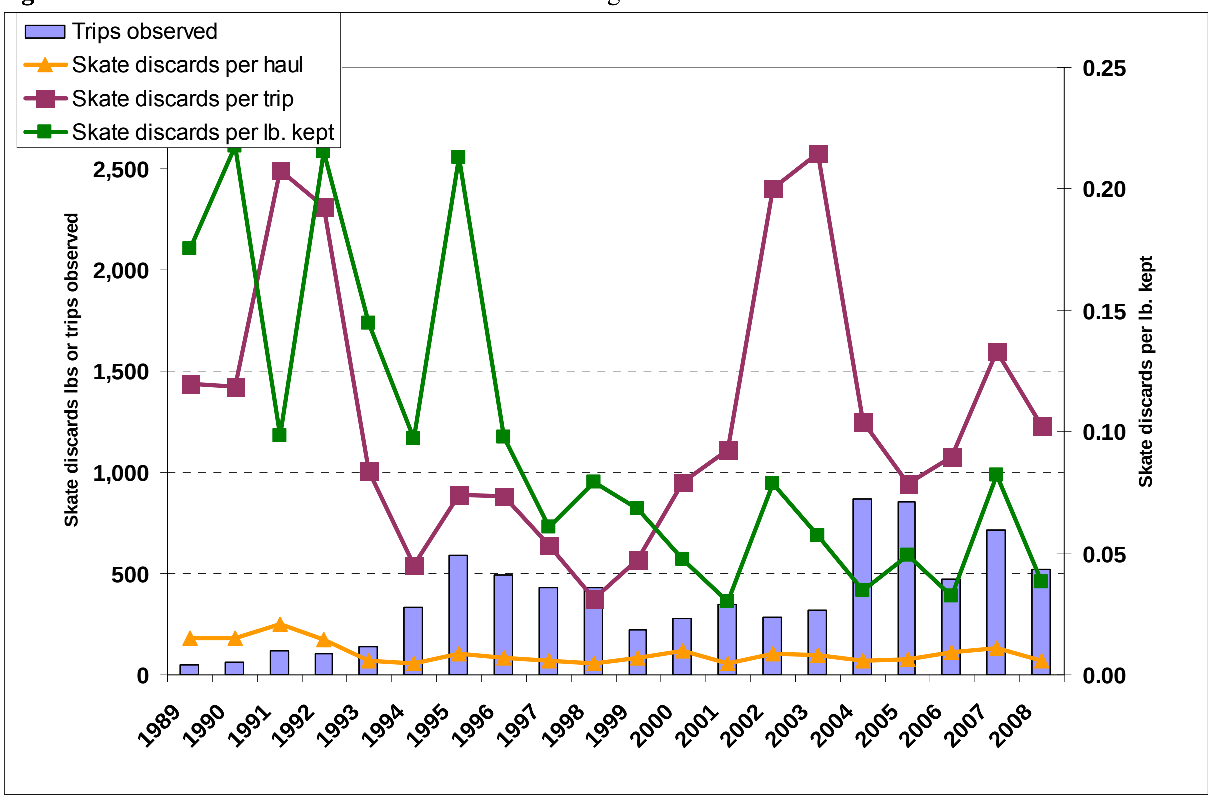


Figure 82. Observed skate discards for vessels using trawls on regular Georges Bank region trips.

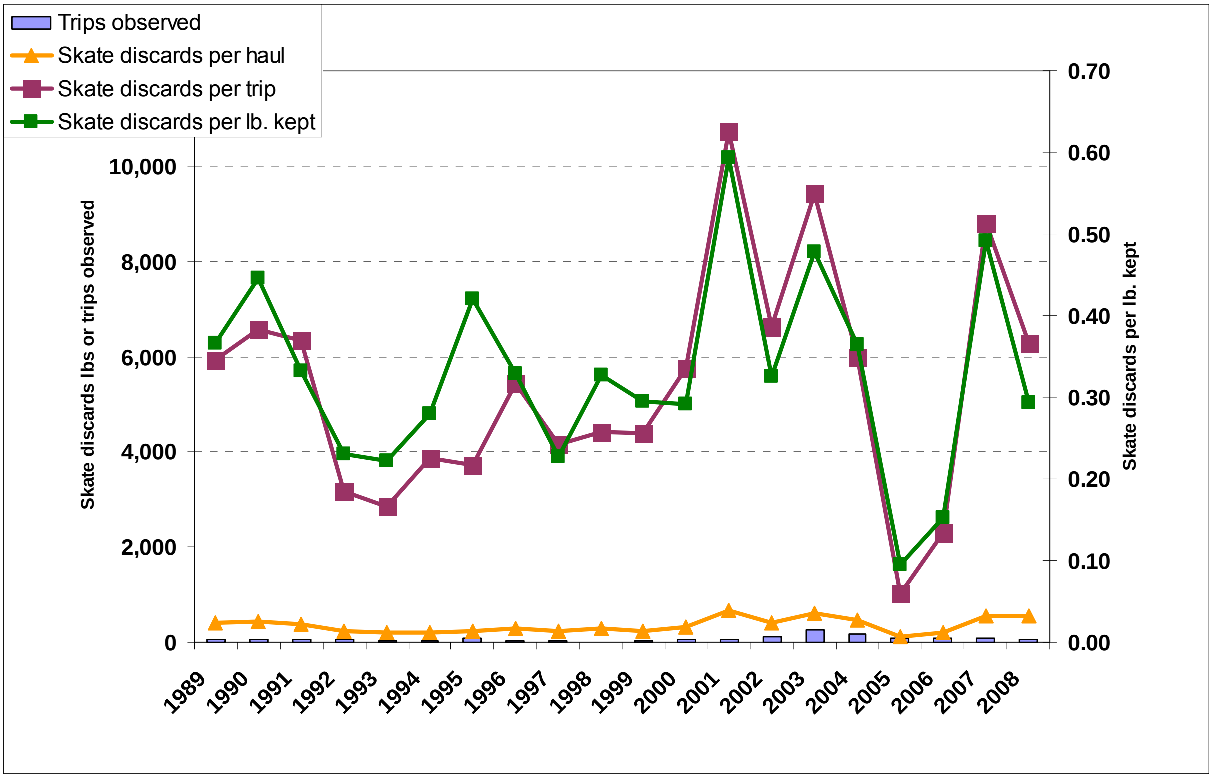


Figure 83. Observed skate discards for vessels using trawls on US/CA trips in the E. Georges Bank sub-region.

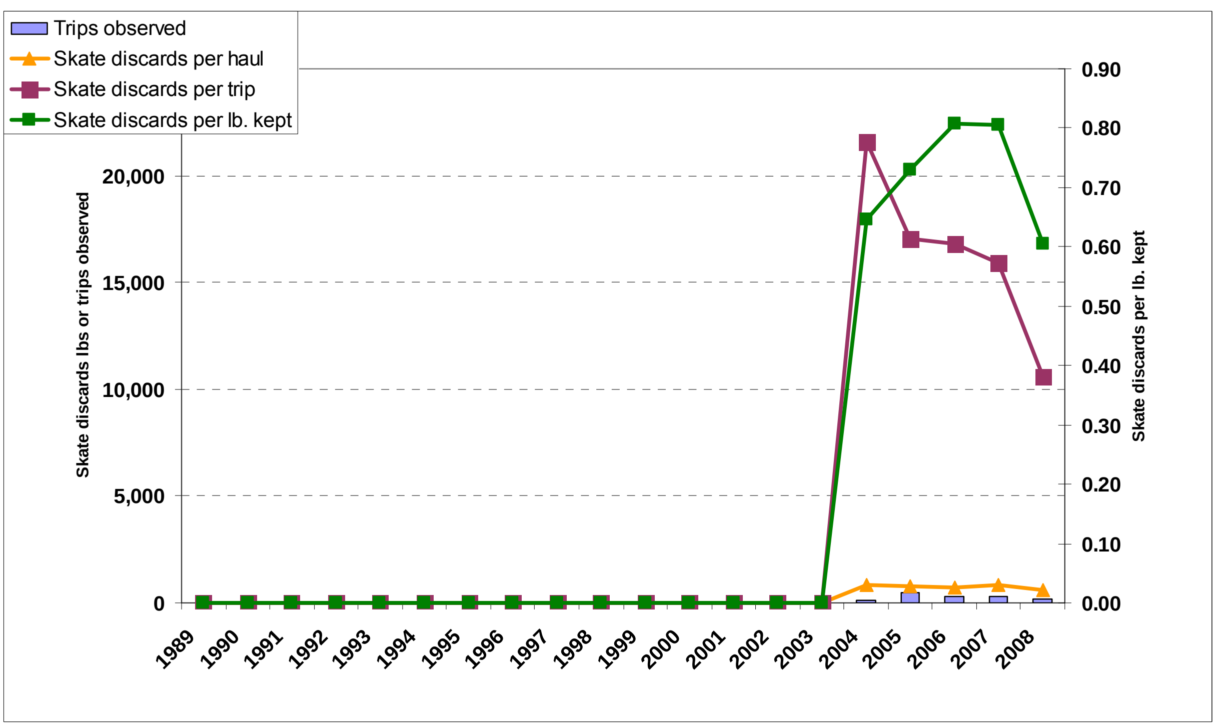


Table 34. GLM statistics for various independent variables predictors of average observed DK ratios.

Stratification model	Statistic					
	Multiple R	F-ratio (df)	p-value	Kolmogorov-Smirnov	Durbin-Watson D	AIC
1. NEFSC	0.127	13.45 (24)	0	0.361	1.927	90,347
2. NEFSC regular trips	0.112	7.573 (24)	0	0.378	1.945	69,420
3. Gear/ Sub-region	0.136	14.012 (27)	0	0.358	1.930	92,665
4. Gear/ sub-region/ season/mesh	0.136	9.902 (28)	0	0.368	1.941	71,517

Table 35. GLM statistics and results for Model 1, gear/region/quarter.

Analysis of Variance

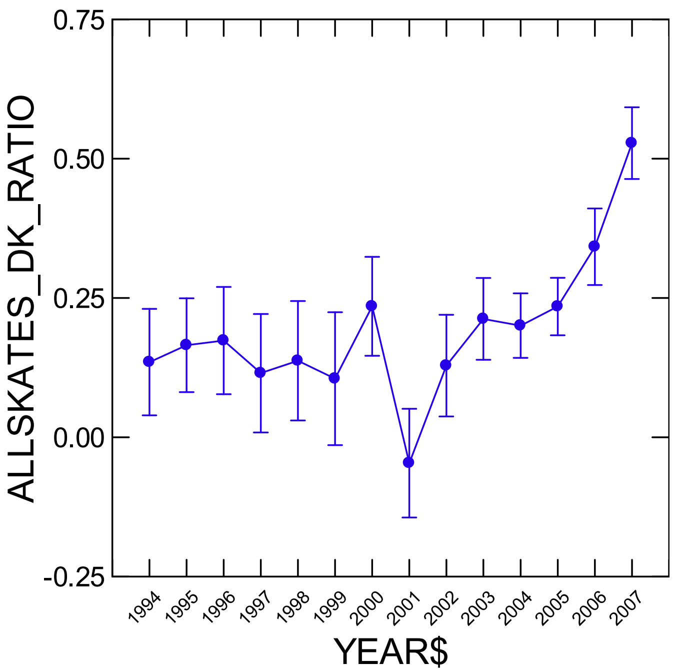
Source	Type III SS	df	Mean Squares	F-ratio	p-value
YEAR$	307.2600	13	23.6354	4.0798	0.0000
GEAR$	1035.3742	5	207.0748	35.7442	0.0000
REGION$	140.1059	3	46.7020	8.0615	0.0000
QTR$	23.3255	3	7.7752	1.3421	0.2587
Error	113738.7331	19633	5.7932		

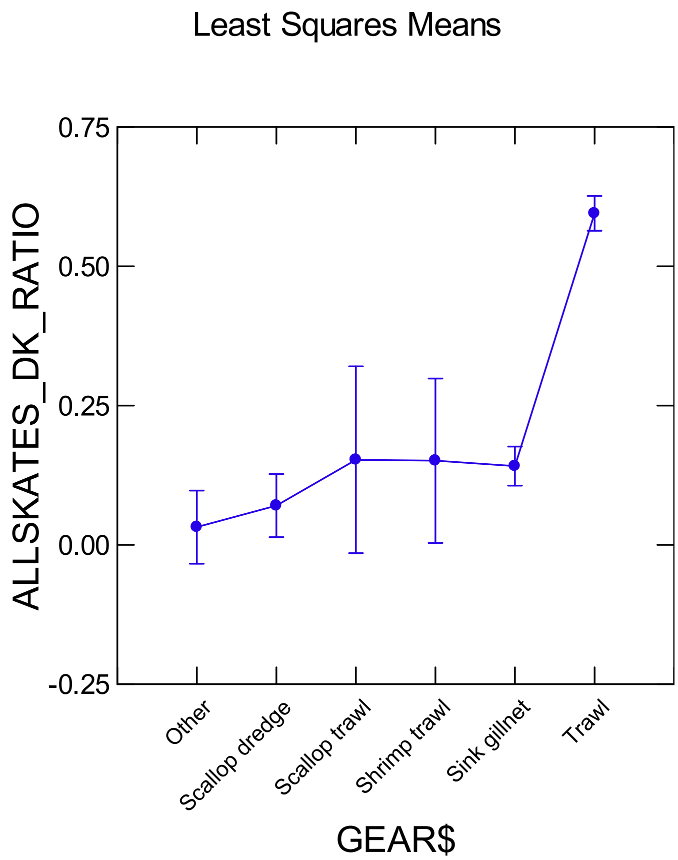
Estimates of Effects B = $(X'X)^{-1}X'Y$

Factor	Level	ALLSKATES_DK_RATIO
CONSTANT		0.1932
YEAR$	1994	-0.0532
YEAR$	1995	-0.0242
YEAR$	1996	-0.0193
YEAR$	1997	-0.0731
YEAR$	1998	-0.0556
YEAR$	1999	-0.0910
YEAR$	2000	0.0417
YEAR$	2001	-0.2394
YEAR$	2002	-0.0589
YEAR$	2003	0.0209
YEAR$	2004	0.0098
YEAR$	2005	0.0469
YEAR$	2006	0.1568
GEAR$	Other	-0.1614
GEAR$	Scallop dredge	-0.1201
GEAR$	Scallop trawl	-0.0262
GEAR$	Shrimp trawl	-0.0413
GEAR$	Sink gillnet	-0.0526
REGION$	GB	-0.0575
REGION$	GOM	-0.1278

Estimates of Effects B = (X'X)$^{-1}$X'Y		
Factor	**Level**	**ALLSKATES_DK_RA-TIO**
REGION$	MA	0.0080
QTR$	1.000000	-0.0405
QTR$	2.000000	0.0334
QTR$	3.000000	-0.0295

Least Squares Means




Least Squares Means
0.75
0.50
0.25
0.00
-0.25
ALLSKATES_DK_RATIO
Other
Scallop dredge
Scallop trawl
Shrimp trawl
Sink gillnet
Trawl
GEAR$

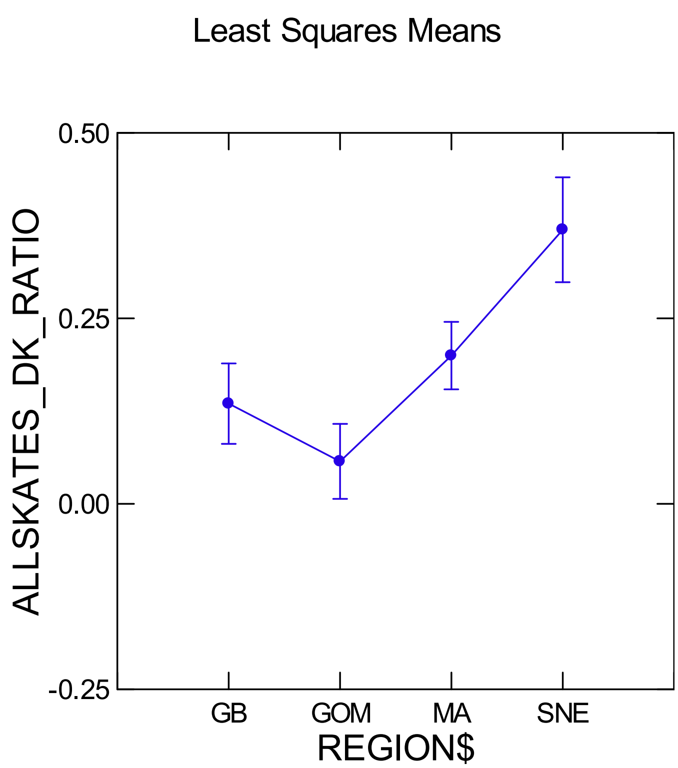

Least Squares Means
0.50
0.25
0.00
-0.25
ALLSKATES_DK_RATIO
GB
GOM
MA
SNE
REGION$

Table 36. GLM statistics and results for Model 2, gear/region/quarter, using only regular management program observed trips.

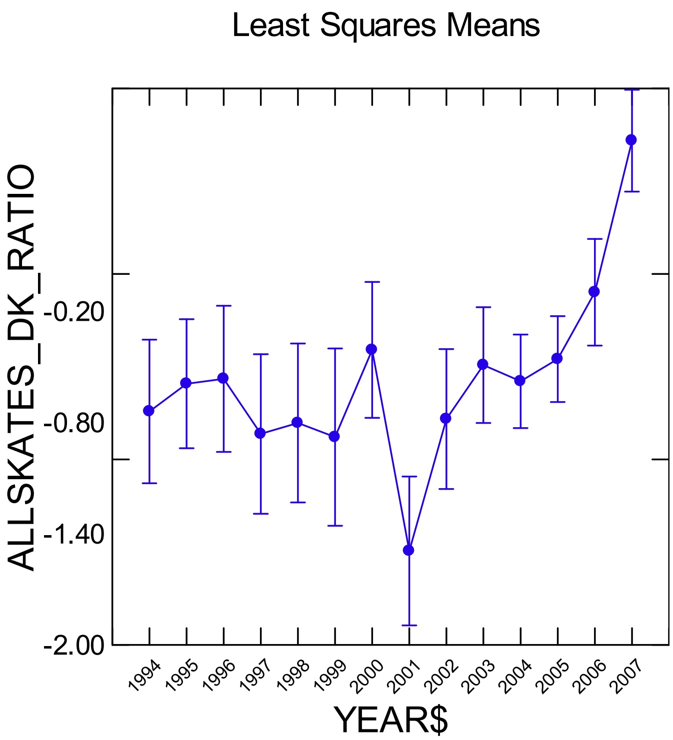
Analysis of Variance					
Source	Type III SS	df	Mean Squares	F-ratio	p-value
YEAR$	371.1617	13	28.5509	3.8103	0.0000
GEAR$	601.7510	5	120.3502	16.0615	0.0000
REGION$	67.3027	3	22.4342	2.9940	0.0296
QTR$	33.3625	3	11.1208	1.4841	0.2166
Error	106679.1384	14237	7.4931		

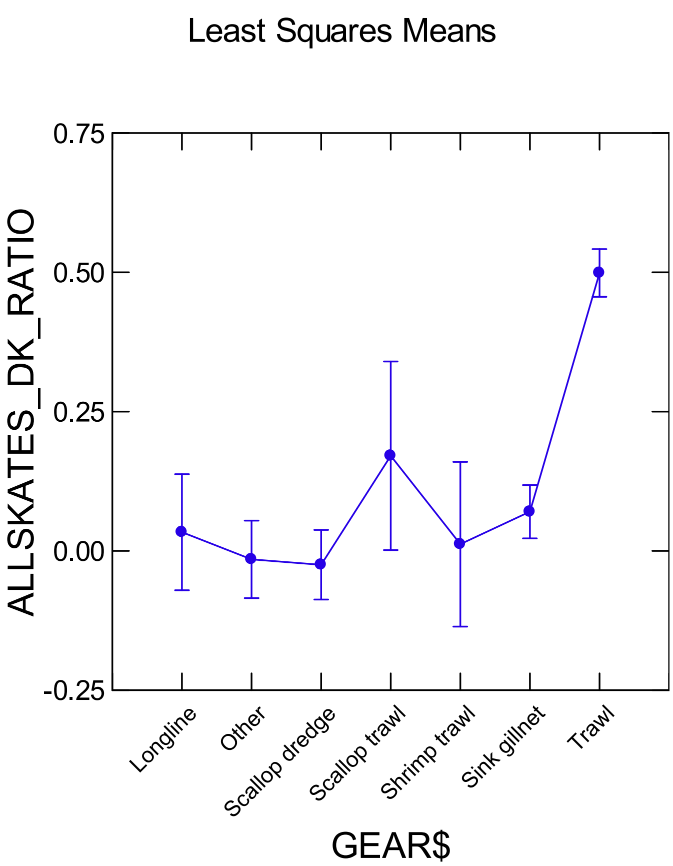
Estimates of Effects $B = (X'X)^{-1}X'Y$		
Factor	Level	ALLSKATES_DK_RA-TIO
CONSTANT		0.2075
YEAR$	1994	-0.0629
YEAR$	1995	-0.0254
YEAR$	1996	0.0037
YEAR$	1997	-0.0752
YEAR$	1998	-0.0660
YEAR$	1999	-0.1071
YEAR$	2000	0.0294
YEAR$	2001	-0.2749
YEAR$	2002	-0.0525
YEAR$	2003	0.0028
YEAR$	2004	-0.0375
YEAR$	2005	0.0097
YEAR$	2006	0.1379
GEAR$	Other	-0.1651
GEAR$	Scallop dredge	-0.0354
GEAR$	Scallop trawl	0.0017
GEAR$	Shrimp trawl	-0.1078
GEAR$	Sink gillnet	-0.0570
REGION$	GB	-0.0754
REGION$	GOM	-0.0773
REGION$	MA	-0.0015
QTR$	1.000000	-0.0389
QTR$	2.000000	0.0372
QTR$	3.000000	-0.0556

Table 37. GLM statistics and results for Model 3, DK rates post stratified by gear and sub-region.

Analysis of Variance					
Source	**Type III SS**	**df**	**Mean Squares**	**F-ratio**	**p-value**
YEAR$	277.7085	13	21.3622	3.8130	0.0000
GEAR$	966.1356	6	161.0226	28.7414	0.0000
SUB_REGION$	378.6510	8	47.3314	8.4483	0.0000
Error	113629.0190	20282	5.6025		

Factor	Level	ALLSKATES_DK_RATIO
CONSTANT		0.1064
YEAR$	1994	-0.0418
YEAR$	1995	-0.0045
YEAR$	1996	0.0022
YEAR$	1997	-0.0721
YEAR$	1998	-0.0573
YEAR$	1999	-0.0764
YEAR$	2000	0.0412
YEAR$	2001	-0.2299
YEAR$	2002	-0.0521
YEAR$	2003	0.0208
YEAR$	2004	-0.0011
YEAR$	2005	0.0288
YEAR$	2006	0.1189
GEAR$	Longline	-0.0729
GEAR$	Other	-0.1217
GEAR$	Scallop dredge	-0.1314
GEAR$	Scallop trawl	0.0643
GEAR$	Shrimp trawl	-0.0946
GEAR$	Sink gillnet	-0.0362
SUB_REGION$	Delmarva	-0.0171
SUB_REGION$	E. GB	0.1545
SUB_REGION$	E. GM	-0.3530
SUB_REGION$	NY Bight	0.2262
SUB_REGION$	Offshore	-0.2487
SUB_REGION$	Other	0.0182
SUB_REGION$	S. Channel	-0.0531
SUB_REGION$	SNE	0.2751


Least Squares Means
ALLSKATES_DK_RATIO
-0.20
-0.80
-1.40
-2.00
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
YEAR$


Least Squares Means
ALLSKATES_DK_RATIO
0.75
0.50
0.25
0.00
-0.25
Longline
Other
Scallop dredge
Scallop trawl
Shrimp trawl
Sink gillnet
Trawl
GEAR$

Least Squares Means

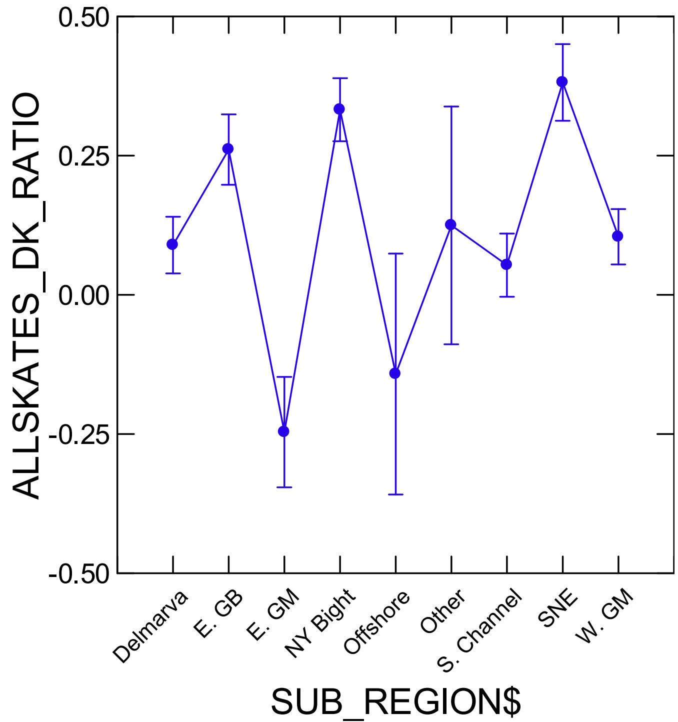


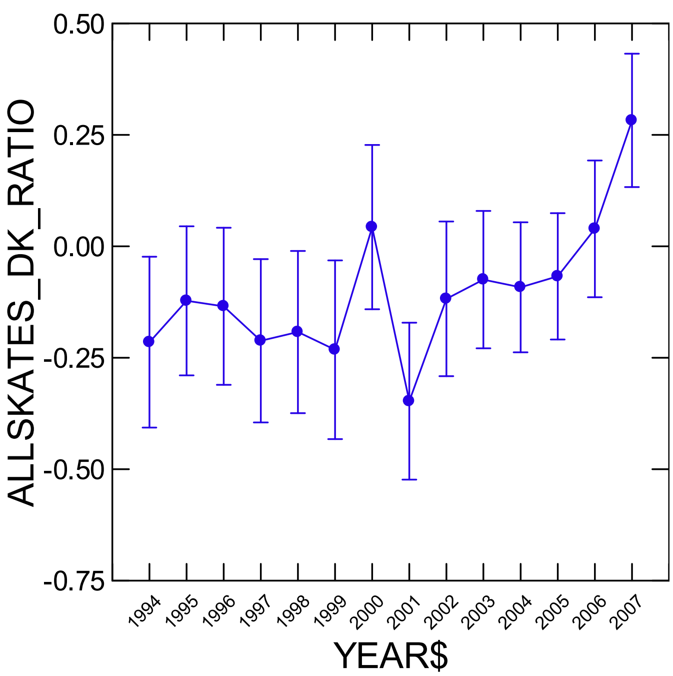
Table 38. GLM statistics and results for Model 4, DK rates post stratified by gear, sub-region, season, and mesh.

Analysis of Variance					
Source	**Type III SS**	**df**	**Mean Squares**	**F-ratio**	**p-value**
YEAR$	282.2944	13	21.7150	3.0537	0.0002
GEAR$	332.8477	4	83.2119	11.7016	0.0000
SUB_REGION$	518.3715	8	64.7964	9.1120	0.0000
SEASON$	26.4886	2	13.2443	1.8625	0.1553
MESH$	244.0847	2	122.0423	17.1621	0.0000
Error	105372.8981	14818	7.1111		

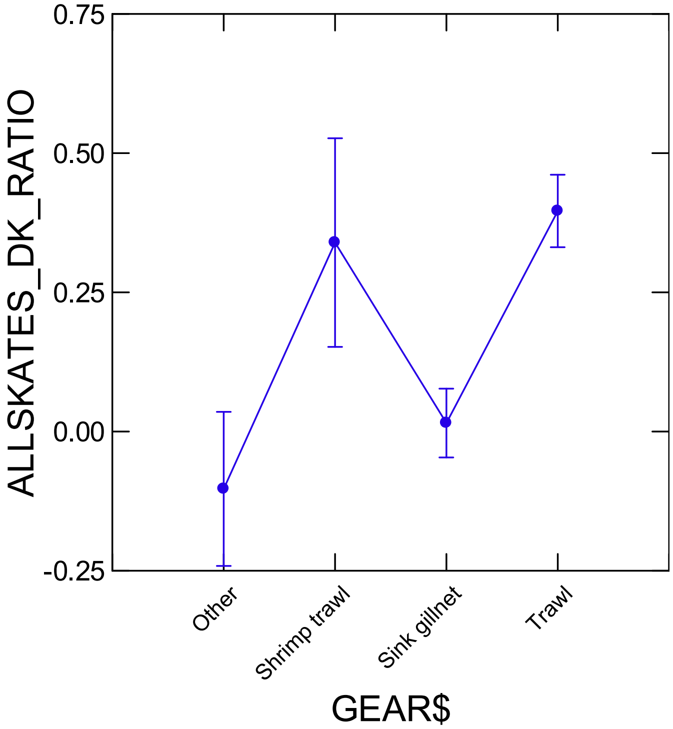
Estimates of Effects B = $(X'X)^{-1}X'Y$		
Factor	**Level**	**ALLSKATES_DK_RA-TIO**
CONSTANT		0.5507
YEAR$	1994	-0.4975
YEAR$	1995	-0.4047
YEAR$	1996	-0.4169
YEAR$	1997	-0.4944
YEAR$	1998	-0.4748
YEAR$	1999	-0.5144
YEAR$	2000	-0.2394
YEAR$	2001	-0.6300
YEAR$	2002	-0.4004
YEAR$	2003	-0.3571

Estimates of Effects B = (X'X)^-1X'Y		
Factor	**Level**	**ALLSKATES_DK_RATIO**
YEAR$	2004	-0.3743
YEAR$	2005	-0.3498
YEAR$	2006	-0.2432
GEAR$	Other	-0.4991
GEAR$	Shrimp trawl	-0.0567
GEAR$	Sink gillnet	-0.3809
SUB_REGION$	Delmarva	0.1714
SUB_REGION$	E. GB	0.2404
SUB_REGION$	E. GM	-0.3755
SUB_REGION$	NY Bight	0.4924
SUB_REGION$	Offshore	-0.0499
SUB_REGION$	Other	0.2337
SUB_REGION$	S. Channel	0.0072
SUB_REGION$	SNE	0.4252
MESH$	Large	0.2542
MESH$	Small	-0.0982
SEASON$	FALL	0.1023
SEASON$	SPRING	0.0493

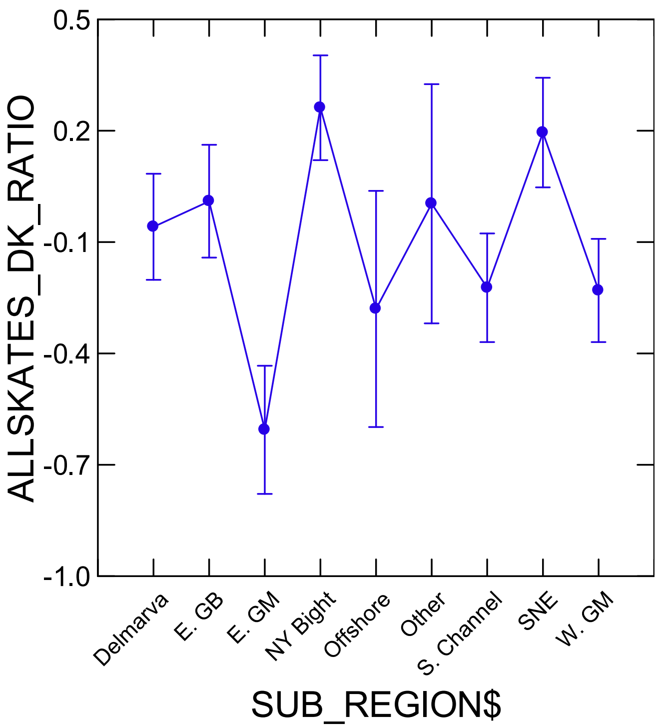
Least Squares Means

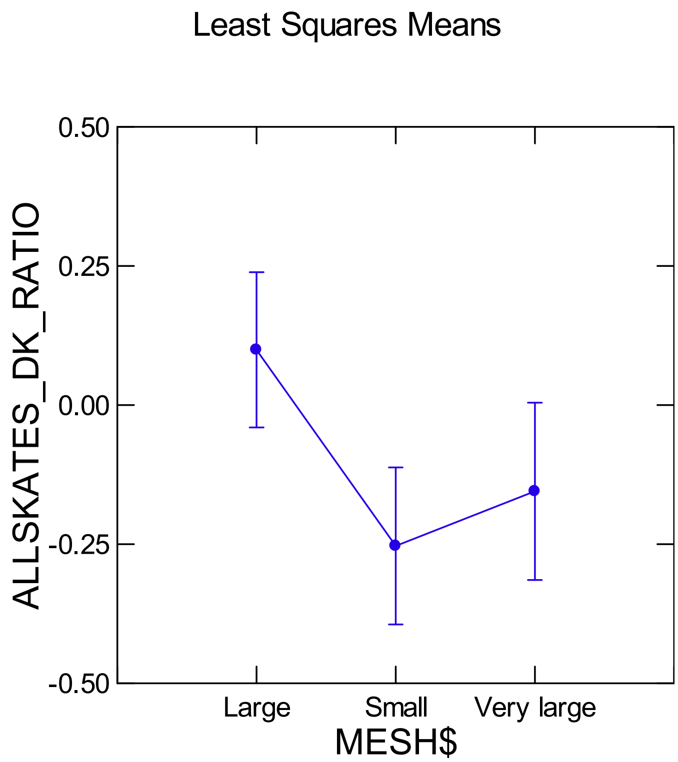


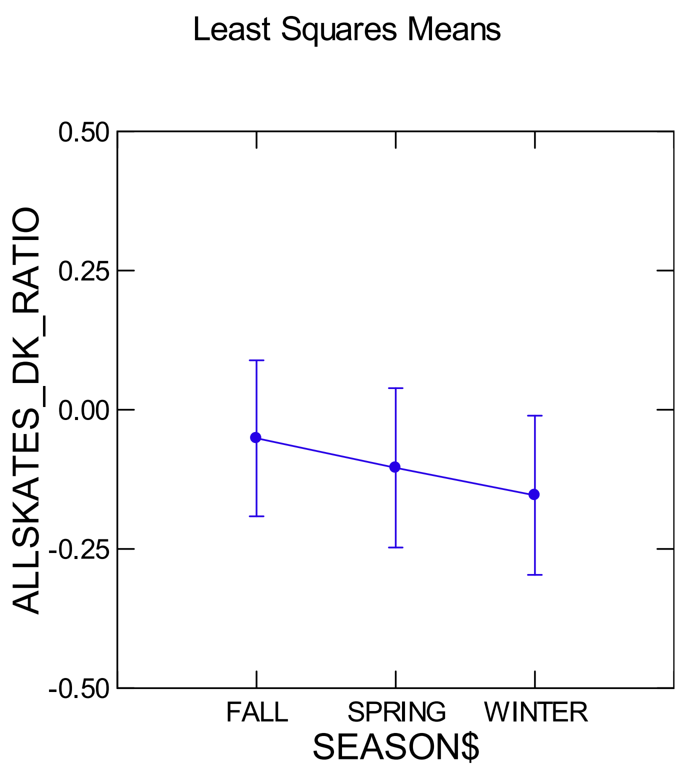
Least Squares Means



Least Squares Means




Least Squares Means
0.50
0.25
0.00
-0.25
-0.50
ALLSKATES_DK_RATIO
Large
Small
Very large
MESH$


Least Squares Means
0.50
0.25
0.00
-0.25
-0.50
ALLSKATES_DK_RATIO
FALL
SPRING
WINTER
SEASON$

19. Document 19

Skate Stock Status Update 2008

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
55 Great Republic Drive
Gloucester, MA 01930-2276

MAY - 4 2009

RECEIVED
MAY - 5 2009
NEW ENGLAND FISHERY MANAGEMENT COUNCIL

John W. Pappalardo, Chairman
New England Fishery Management Council
50 Water Street, Mill 2
Newburyport, MA 01950

Dear John:

By this letter, NOAA's National Marine Fisheries Service (NMFS), on behalf of the Secretary of Commerce, is notifying the New England Fishery Management Council (Council) that it has been determined that smooth skate (*Malacoraja senta*) is overfished. According to the biomass reference points recommended by the 2008 Northeast Data Poor Stocks Working Group (DPWG) assessment of the Northeast skate complex, smooth skate is considered to be in an overfished condition when the 3-year moving average of the autumn trawl survey mean weight per tow falls below one-half of the 75th percentile of the survey time series from 1963-2007 (i.e., below 0.145 kg/tow). Based upon the attached information provided by Dr. Nancy Thompson, Director of the Northeast Fisheries Science Center (Center), the 3-year average for 2006-2008 is 0.13 kg/tow, which is less than the 0.145-kg/tow threshold. The current 3-year average is also below the pre-DPWG biomass threshold specified in the Northeast Skate Complex Fishery Management Plan (FMP) of 0.16 kg/tow. Smooth skate is therefore considered to be overfished.

Thorny skate (*Amblyraja radiata*) also remains in an overfished condition, but is no longer considered subject to overfishing, as the percent decline between consecutive 3-year moving averages of the autumn trawl survey mean weight per tow is less than 20 percent. Based on information provided by the Center, the 3-year mean weight per tow for thorny skate was 0.42 kg/tow during 2006-2008, which is below the biomass threshold (2.06 kg/tow), but only represents a 1.2-percent decline from 2005-2007. Thorny skate is therefore overfished, but not experiencing overfishing.

Section 304(e)(3) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires the Council, within 1 year of this notice, to prepare an FMP amendment to address the overfished condition of smooth skate and to rebuild the stock. However, given that an amendment to the Skate FMP is currently nearing completion (Amendment 3), and that a rebuilding plan for smooth skate was included in the Draft Environmental Impact Statement for Amendment 3, and approved by the Council at its April 2009 meeting, it is expected that the required rebuilding plan will be included in the Final Amendment 3 document.

Although this new stock status information provided by the Center should be incorporated appropriately into Amendment 3, the Council remains bound by the recommendation of the Scientific and Statistical Committee (SSC) when specifying ACLs for the skate complex. In February 2009, the SSC recommended an acceptable biological catch for the skate complex of 23,826 mt per year, through fishing year 2011. Pursuant to section 302(h)(6) of the MSA, the ACL in Amendment 3 may not exceed this value.

Please contact me if you have any questions with these revised status determinations.

Sincerely,

Chris Mantzaris

for Patricia A. Kurkul
Regional Administrator

Attachments

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northeast Fisheries Science Center
166 Water Street
Woods Hole, MA 02543-1026

April 13, 2009

MEMORANDUM FOR: Patricia A. Kurkul
Regional Administrator, NER

FROM: Nancy B. Thompson, Ph.D.
Science and Research Director

SUBJECT: Update of Skate Stock Status Based on the Northeast Data Poor Stocks Working Group Meeting (December 2008) and New Data from the 2008 NEFSC Autumn Bottom Trawl Survey

This memo provides an update on the status of the seven species of skates in the Northeast region based on both updated biomass Biological Reference Points (BRPs) from the recent NE Data Poor Stocks WG meeting (NEFSC CRD 09-02) and relative biomass indices from the 2008 NEFSC Autumn Bottom Trawl Survey. Based on this information, two skate species (smooth and thorny) are overfished, but overfishing is not occurring on any of the skate species.

For smooth skate, the three-year moving average of 0.13 kg/tow is below the biomass threshold of 0.145 kg/tow (calculated as ½ the 75th percentile of the survey time series from 1963-2007). For thorny skate, the three-year moving average of 0.42 kg/tow is below the biomass threshold of 2.06 kg/tow (calculated as ½ the 75th percentile of the survey time series from 1963-2007).

For winter skate, the three-year moving average increased to 5.23 kg/tow, and is above the biomass threshold of 2.8 kg /tow (calculated as ½ the 75th percentile of the survey time series from 1967-2007), but is not yet rebuilt to the B_{MSY} proxy of 5.6 kg/tow.

The overfishing definition for thorny skate is defined by the percent change between consecutive three year moving averages of survey biomass (kg) per tow. When this percentage declines by at least 20%, then overfishing is occurring. For thorny skate, the 3-year average catch per tow was 0.42 kg/tow during 2006-2008, a percent change of -1.2% from the 2005-2007 average. Therefore, overfishing is not occurring in this species.

BACKGROUND

The last memo on skate stock status from the NEFSC to the NERO (dated 27 June 2008) indicated that three skate species (smooth, thorny, and winter) were overfished, and that overfishing was occurring on only one species (thorny).

Subsequently, the Northeast Data Poor Stocks Working Group Meeting occurred in December 2008. At this meeting, all of the skate biomass reference points were updated by including a longer survey time series of survey data. The revised biomass thresholds (listed in Table 43 of NEFSC CRD 09-02) for smooth and winter skates were lower than their previous values, which led to the conclusion that these two stocks were not overfished. Therefore, based on the conclusions of the Data Poor Stocks Working Group Meeting, only one species (thorny) was overfished, and overfishing was occurring on only one species (thorny). At the Data Poor Meeting, the most recent survey data available was from the 2007 autumn bottom trawl survey.

UPDATED RESULTS BY SPECIES

There are seven species of skates occurring along the North Atlantic coast of the United States: winter skate (*Leucoraja ocellata*), little skate (*L. erinacea*), barndoor skate (*Dipturus laevis*), thorny skate (*Amblyraja radiata)*, smooth skate (*Malacoraja senta*), clearnose skate (*Raja eglanteria*), and rosette skate (*L. garmani*). Skates are currently managed under the New England Fishery Management Council's Skate Fishery Management Plan implemented in 2003. This plan includes mandatory reporting by species, possession prohibitions on barndoor, thorny, and smooth skates, trip limits for winter skate, and a suite of measures in other fisheries management plans to aid in the recovery of the overfished skate species.

Indices of relative abundance (stratified mean weight per tow) have been developed from the NEFSC bottom trawl surveys for the seven species in the skate complex, and these form the basis for most of the conclusions about the status of the complex. All statistically significant NEFSC gear, door, and vessel conversion factors were applied to little, winter, and smooth skate indices when applicable. The strata sets used for each species are listed in the attached Table.

Biomass reference points are based entirely on NEFSC survey data because reliable landings and discard information are not available by species. For all species but barndoor, the B_{MSY} proxy is defined as the 75th percentile of the appropriate survey biomass index time series for that species (values are given in the attached Table and Figure). For barndoor skate, the B_{MSY} proxy is still the average of 1963-1966 autumn survey biomass indices because the survey did not catch barndoor during a protracted time period of years.

Fishing mortality reference points are based on changes in survey biomass indices. If the three-year moving average of the survey biomass index for a skate species declines by more than the average CV of the survey time series, then fishing mortality is assumed to be greater than F_{MSY} and overfishing is occurring for that species. The average CVs of the indices are given by species in the attached Table as "Percent change for overfishing status determination in FMP."

For winter skate, the 2006-2008 NEFSC autumn average biomass index of 5.23 kg/tow is above the biomass threshold reference point (2.80 kg/tow), and thus the species is no longer overfished but is not yet rebuilt to B_{MSY}. The 2006-2008 average index is well above the 2005-2007 index by 78%, therefore overfishing is not occurring.

For little skate, the 2006-2008 NEFSC spring average biomass index of 5.04 kg/tow is above the biomass threshold reference point (3.51 kg/tow), and thus the species is not overfished. The

2006-2008 average index is above the 2005-2007 index by 37%, therefore overfishing is not occurring.

For barndoor skate, the 2006-2008 NEFSC autumn average survey biomass index of 1.02 kg/tow is above the biomass threshold reference point (0.81 kg/tow), and thus the species is not overfished, but is not yet rebuilt to B_{MSY}. The 2006-2008 average index is above the 2005-2007 index by 2%, therefore overfishing is not occurring.

For thorny skate, the 2006-2008 NEFSC autumn average biomass index of 0.42 kg/tow is well below the biomass threshold reference point (2.06 kg/tow), indicating that the species is in an overfished condition. The 2006-2008 index is lower than the 2005-2007 index by 1.2%, but overfishing is not occurring as this decline is not below 20%.

For smooth skate, the 2006-2008 NEFSC autumn average biomass index of 0.13 kg/tow is below the biomass threshold reference point (0.145 kg/tow) and thus the species is now again overfished. The 2006-2008 index is below the 2005-2007 index by 8%, but overfishing is not occurring as this decline is less than the 30% reference decline level.

For clearnose skate, the 2006-2008 NEFSC autumn average biomass index of 1.04 kg/tow is above both the biomass threshold reference point (0.38 kg/tow) and the B_{MSY} proxy (0.77 kg/tow), and hence the species is not overfished. The 2006-2008 index is above the 2005-2007 index, and therefore overfishing is not occurring.

For rosette skate, the 2006-2008 NEFSC autumn average biomass index of 0.052 kg/tow is above both the biomass threshold reference point (0.024 kg/tow) and the B_{MSY} proxy (0.048 kg/tow), and thus the species is not overfished. The 2006-2008 index is lower than the 2005-2007 index by 19%, but overfishing is not occurring as this decline is not below 60%.

CITATION

Northeast Data Poor Stocks Working Group. 2009. The Northeast Data Poor Stocks Working Group Report, December 8-12, 2008 Meeting. Part A. Skate species complex, Deep sea red crab, Atlantic wolffish, Scup, and Black sea bass. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 09-02; 496 p.

cc: F. Serchuk
F. Almeida
R. Merrick
J. Weinberg
P. Rago
K. Sosebee

	BARNDOOR	CLEARNOSE	LITTLE	ROSETTE	SMOOTH	THORNY	WINTER
Survey (kg/tow) Time series basis Strata Set	**Autumn 1963-1966 Offshore 1-30, 33-40**	**Autumn 1975-2007 Offshore 61-76, Inshore 15-44**	**Spring 1982-2008 Offshore 1-30, 33-40, 61-76, Inshore 1-66**	**Autumn 1967-2007 Offshore 61-76**	**Autumn 1963-2007 Offshore 1-30, 33-40**	**Autumn 1963-2007 Offshore 1-30, 33-40**	**Autumn 1967-2007 Offshore 1-30, 33-40, 61-76**
1999	0.30	1.05	9.98	0.07	0.07	0.48	5.09
2000	0.29	1.03	8.60	0.03	0.15	0.83	4.38
2001	0.54	1.61	6.84	0.12	0.29	0.33	3.89
2002	0.78	0.89	6.44	0.05	0.11	0.44	5.60
2003	0.55	0.66	6.49	0.03	0.19	0.74	3.39
2004	1.30	0.71	7.22	0.05	0.21	0.71	4.03
2005	1.04	0.52	3.24	0.07	0.13	0.22	2.62
2006	1.17	0.53	3.32	0.06	0.21	0.73	2.48
2007	0.80	0.85	4.46	0.07	0.09	0.32	3.71
2008	1.09	1.73	7.34	0.03	0.10	0.21	9.50
2003-2005 3-year average	0.96	0.63	5.65	0.049	0.18	0.56	3.34
2004-2006 3-year average	1.17	0.59	4.59	0.057	0.19	0.55	3.04
2005-2007 3-year average	1.00	0.64	3.67	0.064	0.14	0.42	2.93
2006-2008 3-year average	1.02	1.04	5.04	0.052	0.13	0.42	5.23
Percent change 2006-2008 compared to 2005-2007	+1.9	+62.9	+37.2	-18.9	-7.6	-1.2	+78.2
Percent change for overfishing status determination in FMP	-30	-30	-20	-60	-30	-20	-20
Biomass Target	1.62	0.77	7.03	0.048	0.29	4.12	5.60
Biomass Threshold	0.81	0.38	3.51	0.024	0.145	2.06	2.80
CURRENT STATUS	**Not Overfished Overfishing is Not Occurring**	**Not Overfished Overfishing is Not Occurring**	**Not Overfished Overfishing is Not Occurring**	**Not Overfished Overfishing is Not Occurring**	**Overfished Overfishing is Not Occurring**	**Overfished Overfishing Is Not Occurring**	**Not Overfished Overfishing is Not Occurring**

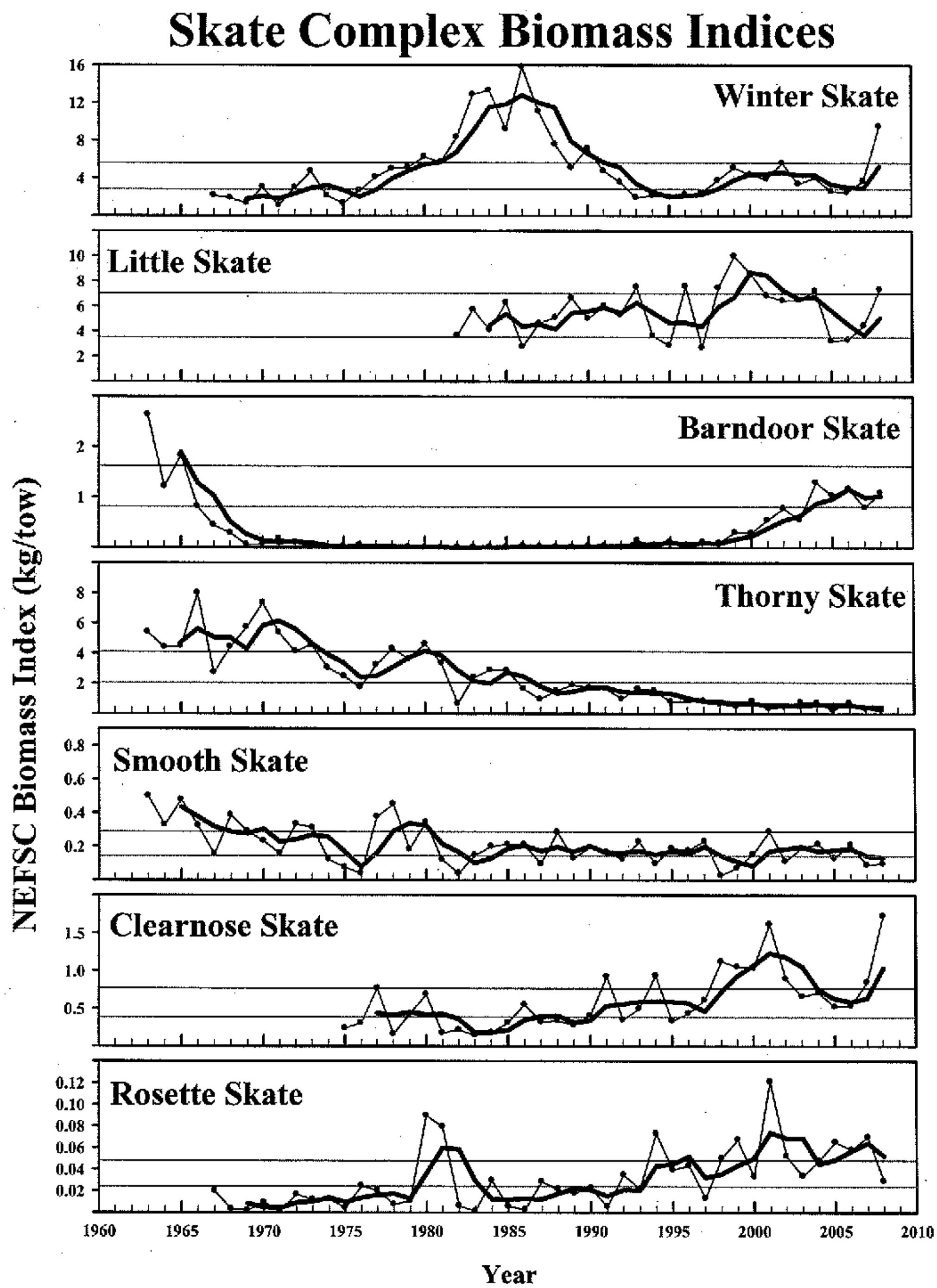


Figure 1. NEFSC survey biomass indices (kg/tow). Thin lines with symbol are annual indices, thick lines are 3-year moving averages, and the thin horizontal lines are the biomass thresholds and targets developed through 2007/2008.